Effect of Teaching Program on Post-operative Health Outcomes for Patients Undergoing Keratoplasty

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Abstract

Corneal blindness has presented a huge challenges public health problem all over the world, particularly in developing countries. Thus, Keratoplasty (PK) is increasingly providing promising results in visual improvement and preserving the structural integrity of the eye, its successful outcome depends on various donors, host factors and surgical technique as well as preoperative teaching that proven beneficial in decreasing postoperative complications and length of hospital stay as well as positively influencing recovery. Patients who are well prepared with a detailed preoperative instruction deal more effectively with their surgery and are better prepared to manage their pain and engage in appropriate self-care activities.**This study aimed** to determine the effect of teaching program on postoperative health outcomes for patients undergoing keratoplasty. **A quasi-experimental design** was conducted a convenience sample of sixty patients undergoing keratoplasty that were divided into two equal groups as study and control. **Setting**: The study was conducted in the Ophthalmology department at the Alexandria Main University Hospital and follow up was done in the Ophthalmology outpatient clinic .**Two tools were used for data collection**: Tool I: Keratoplasty Patient's Knowledge Structured Interview Schedule which consisted of two parts: part I; socio-demographic and clinical data& part II; Keratoplasty Patient's Knowledge Questionnaire. Tool II: Patient's Health Outcomes sheet and it's divided into two parts, part I; keratoplasty complications & part II; Self-Care Practices Questionnaire Structured Interview Schedule. The results of the present study revealed a highly statistically significant difference between control and study group regarding their knowledge and level self care practices immediate post and post three months of program implementation. Conclusion**:** applying teaching program had statistically significant improvement in knowledge, self -care practice ,visual function as well as decrease postoperative complication for patients undergoing keratoplasty. Recommendation**:** In service training program should be carried out for ophthalmic nurses about care given to patients undergoing keratoplasty(pre & postoperative care)

Keywords: Keratoplasty, Postoperative Health Outcomes, Teaching Program.

Introduction:

Organ transplantation is the most influential, innovative health care practice of the twentieth century and it has been improved in parallel with scientific advances in medical technology **(Gaum, et al., 2012).** Currently, ten million people worldwide are suffering from eye diseases that are treatable only by corneal transplantation **(Pascolini & Mariotti, 2012).** The cornea represents the eye's most anterior optical surface and any changes in its shape affected the vision **(Iyamu & Osuobeni , 2012).** Diseases that affect the cornea represent one of the leading causes of reversible blindness in the world. These diseases present diverse etiologies such as chronic degenerative inflammatory diseases, infectious diseases and trauma **(Almeida,et al., 2014 , Chaurasia ,et al., 2015, and Xu ,et al.,2016).** World Health Organization (WHO) estimates the number of people with visual impairment at 285 million, and of these, 39 million people are diagnosed with blindness. Ninety percent of these visually impaired people live in low-income settings and 80% of them can be cured or could have their impairment avoided **(Pineda, 2015 & WHO ,2016).**

The concept of corneal transplantation, also called corneal grafting or keratoplasty, it has been evolved rapidly during the last few decades from full-thickness corneal grafts (penetrating keratoplasty) to endothelial keratoplasty **(Crawford,et al.,.2013).** The

major indications for keratoplasty differ across the world, because of the spectrum of corneal disease in each country and the socioeconomic factors influencing the etiology of corneal blinding diseases. Pseudophakic corneal edema (corneal edema as a result of cataract and intraocular lens surgery), keratoconus (where the cornea progressively loses its uniform oval shape and become conic) and regrafts have been the most common clinical indications for corneal transplantation in the developed world **(Pineda, 2015&Jamali, 2019)**.

Recent advancement and refinement in microsurgical techniques create a great transformation in the forms of lamellar keratoplasty and enabled replacement of the affected tissue instead of the full thickness corneal graft. Thus, with the steady innovative improvements in ocular immunology, ocular pharmacology, corneal storage, and eye banking procedures ; keratoplasty have become one of the most widely practiced transplantations in humans **(Siganos, et al., 2010, Young, etal., 2012&Eye Bank Association 2013)** and become the ultimate treatment for an estimated 80–90% of blindness after corneal opacification regardless of various inherent challenges in the developing world **(Feilmeier ,etal.,2010).**

Because the cornea has no blood vessels, a transplanted cornea does not have a natural strength, and this is a major disadvantage for this transplant. So, it is possible that even years after the transplantation, the cornea can be detached by mild trauma or physical activity, and can cause serious complications, including protrusion of the iris, lens and vitreous, premature or delayed retinal detachment, and can eventually lead to blindness **(Jafarinasab,et al., 2013)**. People who receive organ transplants always encounter challenges and unexpected events, including infection, risk of organ transplant rejection and other complications as depression, anxiety, despair, fear, mood disorders, post-traumatic stress disorder , pain, suicide, feelings of guilt towards the organ donor and high sensitivity to survival have been reported in transplant recipients **(Gaum, et al., 2012).**

Transplant rejection and infection are the two main serious post-operative complications of corneal transplant **(Zare, et al., 2012).** In addition to, elevated intraocular pressure,complications related to wound closure, wound leak and suture-related complications that range from symptoms of foreign body sensation, pain, photophobia to infections, and even increased risk of rejection from stimulation of local inflammation **(Fu, et al., 2012).** So, nursing consultation is an important tool for investigating and implementing care that guarantees the patient ideal conditions for transplant and graft maintenance in the immediate postoperative period. This consultation can be used to identify risk factors, existing comorbidities, therapeutic adherence, appropriate use of medications, performance of physical eye examinations, and control of modifiable risk factors, thus ensuring improvement in the quality and transparency of the graft for a longer time **(Mak,et al.,2012, Lewis,et al.,2017& Hinkle & Cheever 2018).** Furthermore, follow-up of these patients from the preoperative until discharge and after discharge is very essential.

No one can neglect that, nurses are in a strategic position for implementing teaching programs that could increase patient compliance and prepare them adequately for self-care at home after hospital discharge **(Lewis ,etal.,2017)**.The nursing role starts from the preoperative period and extends to the postoperative period as well as discharge instructions. This role can be classified into the immediate post-operative care which includes measuring the vital signs, checking the blood sugar and assessing the level of pain. It also includes giving written instructions to the patients and their families on how to use eye drops and medication, wear glasses or eye shield to protect their eyes from injury, wash the eyelid gently with a piece of cotton and to gradually increase daily physical activity. Not just that, they also have to avoid watching the television, reading when they feel tired, getting water, soap in their eyes, carrying heavy objects and constipation for the first week after the surgery. They should also attend the follow up after a week and then again after about three months to monitor healing. Contact the doctor immediately if there are any complaints about any of the following vision loss, the operated

eye becomes very painful or swollen, increased eye redness, nausea, vomiting and excessive coughing **(Mansfield, et al., 2011& Hadavand and Heidary, 2013, Swearingem ,et al.,2015& Needham,et al.,2016)** So, the aim of this study is to evaluate the effect of implementing the teaching program on postoperative health outcomes for patients undergoing keratoplasty.

Aim of the study:

This study aimed to evaluate the effect of teaching program on postoperative health outcomes for patients undergoing keratoplasty.

Research hypothesis: Patients undergoing keratoplasty who receive a teaching program exhibit improvement in knowledge & self-care practices regarding operation which have direct effect on postoperative health outcomes than those who do not.

Operational definition

Health outcomes

In this study, post-operative outcomes for patient's undergoing keratoplasty refer to improved visual function with controlling of postoperative complications, or problems in addition to an improved level of self care practice and independence in performing activities of daily living.

Materials and Method:

Research design: A quasi experimental research design was utilized to conduct this study.

Setting: The study was conducted in the Ophthalmology department at the Alexandria Main University Hospital and follow up was done in the Ophthalmology outpatient clinic.

Subjects: A convenience sample of 60 adult patients admitted to the above mentioned settings and scheduled for keratoplasty.

The Epi info 7 program was used to estimate sample size according to the following parameters:

- Population size= 110 patients
- Expected frequency =50%.
- Maximum error= 10%.
- Confidence coefficient =95%.
- Estimated sample size = 60 patients

Subject were included in the study, according to the following criteria.

a) Adult patients (aged 21- 60 years).
b) Adult patients of both sexes who were undergoing keratoplasty for the first time.
c) Able to communicate verbally.
d) Patients free from a history of other eye disease (e.g. active ocular infectious disease; severe vitreoretinal disease; membrane matrix is obviously fiber-optic and preoperative high intraocular pressure cannot be controlled by drugs).

The study subject was divided into two equal groups (30) patients; Group I (study group) who received teaching program and special care. Group II (control group) who received the routine hospital care only.

Tools: Two tools were used for data collection in this study based on the review of recent related literature .

Tool (I): Keratoplasty Patient's Knowledge Structured Interview Schedule. This tool was developed by the researcher after reviewing the literature **(Khatab ., 2012, Lewis, et al., 2017&Hinkle, et al., 2018)** to assess patient knowledge related to keratoplasty surgery; it comprises two parts:

Part 1: Socio-demographic Characteristics and Clinical data: It includes socio-demographic characteristics of the subjects regarding age, gender, marital status, level of education, occupation and place of residence and clinical data as a diagnosis or indication for keratoplasty, ocular surgical history, risk factors (chronic disease, smoking, and family history).

Part 2: Keratoplasty Patient's Knowledge Questionnaire. This part developed by the researcher after reviewing the literature **(Khatab., 2012, Haidara, et al., 2016, Amiri ,et al., 2017&Hinkle, et al., 2018)** to assess patient knowledge regarding post-operative care of keratoplasty. It consisted of 50 close ended questions covering 4 main areas: 1) Anatomy and physiology of the eye such as eye layers, orbit, cornea, crystalline lens, etc. 2) Corneal disease as causes, risk factors, types, signs and symptoms, diagnosis, in addition to

keratoplasty indications, most common techniques, and complications. 3) Postoperative care after keratoplasty such as proper position after surgery and eye care. 4) Patient and family predischarge instruction regarding the administration of eye medication, eye care,wearing an eye shield and protection of the eye, precautions to prevent infection, food regimen to reduce straining and constipation, exercise and avoiding heavy lifting,unusual symptoms, follow–up and finally postoperative complications.

A scoring system of patient knowledge was done as follows ,each correct and complete answer received two score, correct and incomplete received one score while no answer and do not know had zero score.The total score ranged between 0 to 100. The total knowledge score was categorized by using a scoring system as follows: poor knowledge < 50%, fair knowledge 50 <75 % and good knowledge 75% and more.

Tool II: Patient's Health Outcomes Sheet: The researcher developed it after reviewing the related litrature (**Rho, et al., 2012, Taha,et al., 2015, Haidara ,et al., 2016, & El Shafaey, et al.,2018)** to assess patient's visual problems and self-care practice after keratoplasty surgery. This sheet consisted of two parts include:

Part 1: Keratoplasty Complications: It was adapted from **Haidara ,et al., (2016)** and used to assess presence or absence of signs and symptoms of postoperative complications such as **complications related to wound closure**;wound leak, iris prolapse**, suture-related complications,** it ranges from symptoms of foreign body sensation, pain, epiphora, photophobia,red eye to findings of Filamentary keratitis (FK), infections, **Intraocular pressure-related complications;** corneal edema, surface irregularities, intraocular inflammation, and secondary glaucoma, **complications related to infections;** infectious keratitis, rapid onset of ocular pain, redness, photophobia, discharge, and decreased vision ,**complications related to epithelial healing**; persistent epithelial defects, **choroidal detachment and hemorrhage-related complications;** choroidal detachments, usually due to uveal effusion or hypotony and a choroidal hemorrhage, which is usually accompanied by a sudden onset of pain and change in vision **and primary graft failure**; photophobia,redness ,epiphora and blurred vision. The scoring system (one score) was given for the presence of postoperative complications and (zero) for the absence of postoperative complications.

Part 2: Self-Care Practices Questionnaire Structured Interview Schedule

It was developed by the researcher based on relevant literature (**Rho, et al., 2012& Taha, et al., 2015& El Shafaey, et al.,2018)** to evaluate patient postoperative self-care practice. It comprised (6) main items such as medication management (administration of eye medication,follow prescribed medication, change eye dressing and precautions of the drug side effects), postoperative eye care, precautions followed postoperative (wear eye shield when showering and during sleep , avoid water and soap in the eye , maintain supine postion or other side during bed time,avoiding eye make-up, avoid compression the eye, avoid bending for long period, and avoiding constipation), diet modification (time for eating and drinking, following appropriate food regimen, provision of adequate nutrition, and meals from outside), activities of daily living: time for performing activities (rate of movement, watching TV, driving, exposure to sun, and maximum weight for lifting), and follow-up visits. For scoring, the respondent was given two point for each correct complete answer, one point for correct and incomplete answer and zero point for incorrect answers. For each area, 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 practice was considered adequate if the percent score was 60% or more and inadequate if less than 60%.

Method

1. An approval from the Ethical Research Committee, Faculty of Nursing, Alexandria University was obtained.
2. Permission to get an approval for conducting the study to access the ophthalmology section and conduct the

study was obtained from the director of the Ophthalmology department at Alexandria Main University Hospital after showing title and the purpose of the study.

3. Development of the study tools: Tool I &II part II were developed and translated into Arabic by the researchers.
4. **Validity testing:** Data collection tools were presented to five experts in the medical surgical nursing sector at the Faculty of Nursing to evaluate the validity of the content. The modifications were made according to the experts' judgment on the clarity of the sentences, the adequacy of the content and the sequence of the elements. Experts agree with the content, but recommend minor changes in the language that would make the information clearer and more accurate. Suggested changes have been made.
5. **Reliability testing:** The reliability of the tools was tested by means of Cronbach's alpha. The reliability coefficient for the tool I was (0.861) and tool II was (0.805) which means all tools were reliable.
6. **A pilot study** was conducted on 10% of the total sample size (5 patients) to test the feasibility and applicability of the tools, and to assess the time required to fulfill the tools.
7. **Sample size:** Based on Epi-info 7 program, all available subjects of 60 patients were selected according to the inclusion criteria and assigned to either the study or control group.The first 30 patients were assigned to the control group and watched for the routine hospital nursing care postoperatively, whereas the other 30 patients were assigned to the study group and received the teaching program and care.
8. **Data collection:** After securing the administrative approval, the data collection was started, and continued for a period of 12 months from March 2019 to Febrauary2020.

The actual study was implemented through four phases; assessment phase,program development phase,implementation phase , and evaluation phase.

I-Assessment phase:

Every patient in both groups (study and control group) was interviewed using the interview assessment sheet (tool I) preoperatively, to identify their knowledge about keratoplasty indications, techniques, postoperative care, predischarge instruction and postoperative complications.

II-Program development phase:

Based on the results of the interview assessment sheet and the review of related literature **(Khatab., 2012 , Taha,et al., 2015, Haidara ,et al., 2016, & El Shafaey, et al.,2018)**,an illustrated colored health teaching booklet was developed in Arabic language by the researcher to help the patient and his family to know knowledge related to; anatomy of the eye ,corneal disease such as definition, causes and risk factors, types, signs and symptoms, diagnosis, in addition to keratoplasty indications, most common techniques, and complications. Postoperative care, such as proper position after surgery and eye care. Predischarge instruction and self care practice regarding the administration of eye medication, eye care,wearing an eye shield and protection of the eye, precautions to prevent infection, food regimen to reduce straining and constipation, precautions followed postoperative (wear eye shield when showering and during sleep , avoid water and soap in the eye , maintain supine postion or other side during bed time,avoiding eye make-up, avoid compression the eye, avoid bending for long period, and avoiding constipation), activities of daily living and follow–up and warning signs that required medical care.

- After the development of the booklet, it was submitted to 5 experts in the field to assure its content validity ,clarity and completeness in which rewarding of some words and changing instruction under picture from English to Arabic based on the committee.

III - Program implementation phase:

- Patients in the control group (II) were received routine hospital care, while patients

in the study group (I) were managed as following:

- The individualized teaching session was carried out for each patient and his/or her caregiver before the operation in the ophthalmology department and in the conference room.
- Various teaching methods were used in the form of lectures, discussions, brainstorming, demonstration and re-demonstration. Numerous teaching media were used, such as power point, figures, flipcharts, pens, papers and illustrated videos.
- The program was consisted with theoretical and practical sessions. The program included the following items:

A. Patients' education sessions:

- Two sessions, education for every patient was carried out to provide new knowledge and practice. The duration of each session lasted approximately from 30 minutes to one hour depending on the patients; ability and needs.
- An illustrated booklet in Arabic language was used as a teaching, learning aid during each session. The patients kept the booklet for remembering the instruction and being a motivator for following it.

The first session: It was included theoretical information about: knowledge related to; anatomy of the eye ,corneal disease such as definition, causes and risk factors, types, signs and symptoms, diagnosis, in addition to keratoplasty indications, most common techniques, and complications. Postoperative care, such as proper position after surgery and eye care.

The second session: It was included information about predischarge instruction and self care practice regarding the administration of eye medication, eye care,wearing an eye shield and protection of the eye, precautions to prevent infection, food regimen to reduce straining and constipation, precautions followed postoperative (wear eye shield when showering and during sleep , avoid water and soap in the eye , maintain supine postion or other side during bed time,avoiding eye make-up, avoid compression the eye, avoid bending for long period, and avoiding constipation), activities of daily living and follow–up and warning signs that required medical care.

- Reinforcement of instructions was carried out in the first day postoperatively follow up in the outpatient clinic for about half an hour using the interview assessment sheet (tool I& II) to evaluate patient knowledge & postoperative self-care practice.

IV-Evaluation phase:

- Evaluation of the program was done two times after one week and after three months postoperatively in the outpatient clinic using the tool I assess patient knowledge postoperative and tool II to assess patient's visual problems and self-care practice after keratoplasty.
- Also, in this visit patient checked by the physician using the slit lamp examination to assess the presence or absence of postoperative complications and notifying the researcher the result. The above mentioned activities were done on the first day, first week, and first three months postoperatively.

9. Ethical considerations:

- Informed written consent for voluntary participation in the study was obtained from each patients after explaining the aim of the study. For illiterate patients, verbal explanation of the study purpose and patients' oral consents were secured. Subject's privacy and anonymity were assured.
- All patients were informed that they could withdraw from the study at any time if they wish not to continue .
- Data confidentiality was considered and respected

10. Statistical Analysis:

- The collected data were organized, coded,tabulated and statistically analyzed using SPSS version 23 (Statistical Package for Social Studies) created by(SPSS Inc., Chicago, USA). For numerical values the range mean and standard deviations were calculated.
- Quantitative continuous data were compared using the parametric Student t-test& Repeated measure ANOVA test
- Qualitative categorical variables were compared using chi-square or Fisher exact tests as appropriate.
- Graphics were done by using the Excel program.
- Statistical significance was considered at p-value <0.05.

Results:

Table (1): Frequency distribution of the study and control group according to their socio-demographic characteristics & clinical data.

This table illustrates that, the highest percentage of both the study and control group were between the ages 41-60 years old (86.7% and 80.0%) respectively. Males were more prevalent in the studied sample. Slightly less than two third (60.0%) of patients in the study and the majority (70.0%) of the control groups were married. The secondary education level was prevailing among more than one third (33.3 %) of patients in the study and less than one half (43.3 %) of the control group. More than three-quarters (76.7%) of the study group and two third (66.7%) of the control group were not workers. Also, about two third (66.7 % - 63.3 %) of the study and the control group respectively came from urban areas. The majority (86.7 % - 83.3%) of patients in both study and control groups had no pervious ocular surgery respectively. More than half of both control and study groups were diagnosed with infectious corneal ulcers. Furthermore, nearly two third (66.7% - 60%) of the study and the control group hadn't risked factors of corneal disease respectively. There were no statistically significant differences in socio-demographic characteristics & clinical data between the two groups.

Table (2): Mean scores of patients' knowledge in the study and control group regarding keratoplasty and keratoplasty postoperative care throughout the program intervention.

It is apparent from this table that the study group had high statistically significant mean scores was found between pre, immediate post & post three months from program implementation in relation to eye anatomy, keratoplasty, postoperative care after keratoplasty and pre discharge instruction as compared to the control group (P <0.001*). Although some decline was evident between immediate post and post three months from program implementation yet it was still higher than pre program implementation. Furthermore, the scores for total and all items of knowledge in the studied patients were significantly increased post three month program implementation with Mean ± SD (21.03±5.31), and (74.37±4.66) respectively, where p value was found to be 0.001*.

Figure (1) : Frequency distribution of the study and control group, according to patient's knowledge. In relation to overall knowledge**,** the study results revealed that the most of patients of the study and control group had poor knowledge pre program, while most of the study group had fair knowledge throughout follow up period, and all of patients in control group had poor knowledge after routine nursing care indicating no statistical significant differences between study and control group pre program, while after implementing teaching program, there was a significant differences among study and control group in relation to patients knowledge about keratoplasty, respectively.

Table (3): Overall mean score of the study and control group, according to the patient's self-care practice related to postoperative care of keratoplasty throughout the program intervention.

This table illustrated that there was a highly statistical significant difference between the study and the control group immediate post and post three months from program

implementation in relation to overall self-care practice scores with a mean (115.27±8.67) which includes medication management, eye care, precautions followed postoperative, diet modification, ADL and follow-up . Overall total scores of self-care practice was improved significantly in the study group immediate post and post three months from program implementation in compared with the control group indicating a significant difference between the two groups after implementing a teaching program (P>0.001).

Figure (2) : Frequency distribution of the study and control group, according to patient's self care practice. This figure illustrated that (100.0%, 70.0%& 67.0%)of the control group had inadequate self care practice toward postoperative care of keratoplasty pre and post program implementation respectively. While the study group (100.0%) had inadequate self care practice pre implementation of teaching program and (86.0%&95.0%) adequate self care practice immediately post and post three months from program implementation. The difference was highly statistically significant as regard self care practice toward postoperative care of keratoplasty either within the study group patients and between the control and study group patients after implementing a teaching program (p=0.000*, p=0.000*) respectively.

Table (4): Mean difference and Partial Eta Squared of patients' knowledge in the study and control group regarding keratoplasty and keratoplasty postoperative care throughout the program intervention.

This table displays that the mean difference for total and all items of knowledge of the study group were significantly increased immediately post program implementation and where p values were found to be (<0.001*). **Also, it can be noticed** that there was a highly significant difference (p<0.001) continued post three months of the program implementation with the effect size 99%. Moreover, the scores for total and all items of knowledge of the control group were slightly increased immediately after routine nursing care but the differences were not statistically significant.

Table (5): Mean difference and Partial Eta squared between the study and control group, according to the patient's self-care practice related to postoperative care of keratoplasty throughout the program intervention.

It appears from the table that ,the mean difference for each domain of the patient's self-care practice, including medication management, eye care postoperative ,precautions followed postoperatively,diet modification, ADL and follow-up were improved significantly in the study group immediately post and post three months from program implementation with the effect size 97% compared with the control group indicating a significant difference between the two groups post implementation program (P>0.001).

Table (6): Comparison between the study and control groups in relation to presence of post -operative keratoplasty complications or problems.

This table clarifies that, the minority of both (control and study groups) had problems post operative keratoplasty. Low percentages of studied patients were complaining suture-related complications(6.70%), complications related to infections(10%) and raised intraocular pressure(16.70%) immediate post from program implementation in compared with the control group. There is no statistical significance difference between the two groups in relation to time immediate post and post 3 months from implementation program.

Table (1): Frequency distribution of the study and control groups according to their Sociodemographic characteristics &Clinical data.

Sociodemographic characteristics&Clinical data		(N=60)				Test of sig. (P-value)
		Study Group		Control Group		
		No=30	%	No=30	%	
Age	21-40	6	20.0	9	30.0	$\chi2$=1.364
	41-60	24	80.0	21	70.0	P=.243
Mean±SD		48.43 ± 7.50		45.90 ± 6.43		t=1.40
Min–Max		38-60		35-57		P=0.16
Sex	Male	18	60.0	16	53.3	$\chi2$=0.271
	Female	12	40.0	14	46.7	P= 0.795
Marital status	Single	3	10.0	2	6.7	$\chi2$=0.931 P= 0.818
	Married	18	60.0	21	70.0	
	Divorced	5	16.7	3	10.0	
	Widow	4	13.3	4	13.3	
Educational level	Illiterate	8	26.7	4	13.3	$\chi2$=2.783 P= 0.426
	Read and Write	9	30.0	8	26.7	
	Secondary	10	33.3	13	43.3	
	Higher Education	3	10.0	5	16.7	
Occupation	worker	7	23.3	10	33.3	$\chi2$=0.739 P=0.390
	Not worker	23	76.7	20	66.7	
Area of residence	Urban	20	66.7	19	63.3	$\chi2$=0.073 P= 0.787
	Rural	10	33.3	11	36.7	
Previous ocular surgery	Yes	4	13.3	5	16.7	$\chi2$=0.131 P=1.000
	No	26	86.7	25	83.3	
Indications for keratoplasty	Infectious corneal ulcers	20	66.7	18	60	$\chi2$=1.781 P=.619
	Bullous keratopathy	5	16.7	9	30	
	Keratoconus	3	10.0	2	6.7	
	Other corneal diseases	2	6.7	1	3.3	
Risk factors	No	8	26.7	4	13.3	$\chi2$=2.783 P= 0.426
	Diabetes mellitus	9	30.0	8	26.7	
	Hypertension	10	33.3	13	43.3	
	Cardiovascular disease	3	10.0	5	16.7	

$\chi2$: Chi-square test
*: Statistically significant at P ≤ 0.05

Table (2): Mean scores of patients' knowledge in the study and control group regarding keratoplasty and keratoplasty postoperative care throughout the program intervention

Patients' knowledge	N= (60)						P1 Pre/ Immediate		P2 Immediate /3m		P3 Pre/3m	
	Study(N =30)			Control (N =30)								
	Pre	Immediate post	Post 3months	Pre	Immediate post	Post 3months	M/D	P1	M/D	P2	M/D	P3
Eye anatomy Mean ±SD	2.3±0.99	8.10±0.80	6.50±1.48	2.40±1.19	2.50±1.89	1.87±1.22	0.10	t=0.35 (P=0.72)	5.60	t=14.94 (P=0.00**)	4.63	t=13.21 (P=0.00**)
Keratoplasty Mean ±SD	3.37±1.75	10.10±1.12	7.60±1.04	3.13±1.46	3.33±1.54	2.37±1.30	0.23	t=0.56 (P=0.58)	6.77	t=19.44 (P=0.00**)	5.23	t=17.24 (P=0.00**)
Postoperative care after keratoplasty Mean ±SD	9.10±3.84	42.93±2.12	36.07±3.14	8.67±3.71	11.00±3.17	9.80±3.68	0.43	t=0.44 (P=0.66)	31.93	t=45.86 (P=0.00**)	26.27	t=29.74 (P=0.00**)
Predischarge instruction Mean ±SD	6.27±2.69	27.87±1.78	24.20±2.93	5.90±3.01	6.57±2.13	5.33±3.02	0.37	t=0.50 (P=0.62)	21.30	t=42.09 (P=0.00**)	18.87	t=24.56 (P=0.00**)
Overall knowledge Mean ±SD	21.03±5.31	89.00±4.39	74.37±4.66	20.10±5.22	23.40±6.29	19.37±6.50	0.93	t=0.69 (P=0.50)	65.60	t=46.83 (P=0.00**)	55.00	t=37.66 (P=0.00**)

P1: P value for **Student t-test** for comparing between the two groups in Pre
P2: P value for **Student t-test** for comparing between the two groups in Immediate post
P3: P value for Student t-test for comparing between the two groups in post 3months
*: Statistically significant at P ≤ 0.05

Figure (1): Frequency distribution of the study and control group, according to patient's knowledge throughout the program intervention.

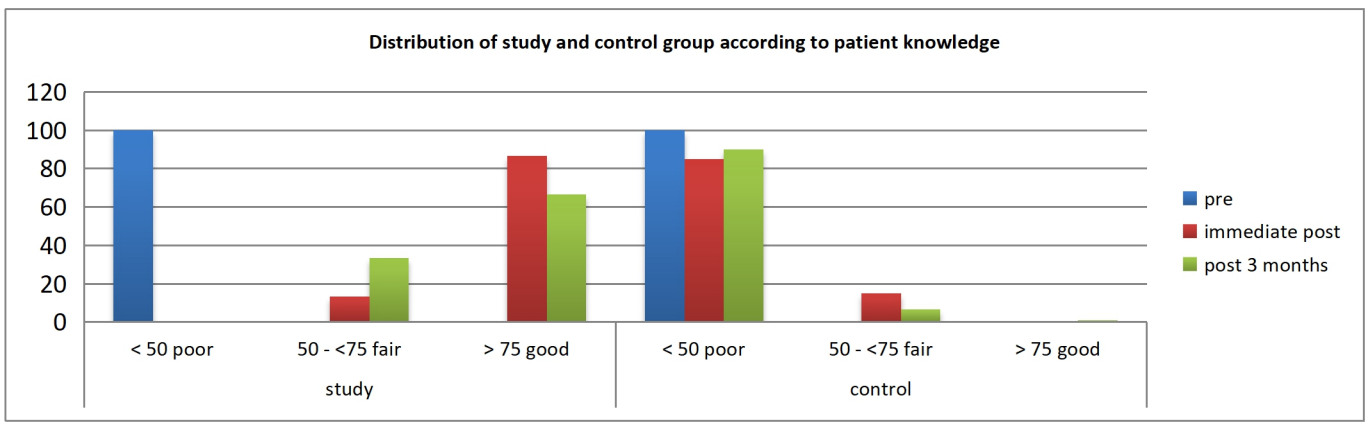

Table (3): Overall mean score of the study and control group, according to the patient's self-care practice related to postoperative care of keratoplasty throughout the program intervention

Patients self care practice	N= (60)						P1 Pre /Immediate		P2 Immediate /3m		P3 Pr/post 3m	
	Study(N =30)			control(N =30)								
	Pre	Immediate post	Post 3months	Pre	Immediate post	Post 3months	M/ D	P1	M/D	P2	M/D	P3
Medication management Mean ±SD	10.47±4.42	19.00±3.12	23.50±2.52	11.80±3.26	8.73±4.18	8.97±2.80	1.33	t=1.33 (P=0.19)	10.27	t=10.79 (P=0.00**)	14.53	t=21.16 (P=0.00**)
Eye care Postoperative Mean ±SD	8.60±3.84	14.27±2.18	17.57±2.78	8.67±2.52	5.97±2.46	3.97±3.07	0.07	t=0.08 (P=0.94)	8.30	t=13.84 (P=0.00**)	13.60	t=18.01 (P=0.00**)
Precautions followed postoperatively Mean ±SD	0.0±0.0	13.77±2.40	17.90±1.77	0.0±0.0	7.97±3.75	4.47±2.73	0.00	t=0.00 (P=1)	5.80	t=7.14 (P=0.00**)	13.43	t=22.64 (P=0.00**)
Diet modification Mean ±SD	1.73±2.08	11.53±1.20	16.37±1.03	1.63±1.77	4.23±2.90	4.13±2.75	0.10	t=0.20 (P=0.84)	7.30	t=12.76 (P=0.00**)	12.23	t=22.80 (P=0.00**)
ADL Mean ±SD	3.30±5.39	21.43±2.69	30.07±2.50	2.77±4.85	8.20±4.51	9.03±4.54	0.53	t=0.40 (P=0.69)	13.23	t=13.82 (P=0.00**)	21.03	t=22.23 (P=0.00**)
Follow-up Mean ±SD	0.63±1.00	8.07±1.26	9.87±0.35	0.67±1.35	2.30±1.32	1.40±2.08	0.03	(t=0.11 P=0.91)	5.77	t=17.34 (P=0.00**)	8.47	t=22.02 (P=0.00**)
Overall-Practice Mean ±SD	24.73±7.56	88.07±6.19	115.27±8.67	25.53±6.62	37.40±14.26	31.97±11.53	0.80	t=0.44 (P=0.66)	50.67	t=17.85 (P=0.00**)	83.30	t=31.63 (P=0.00**)

P1: P value for **Student t-test** for comparing between the two groups in Pre

P2: P value for **Student t-test** for comparing between the two groups in Post P3: P value for **Student t-test** for comparing between the two groups in follow-up

*: Statistically significant at P ≤ 0.05 M/D : mean difference

Figure (2) : Frequency distribution of the study and control group, according to patient's self care practice.

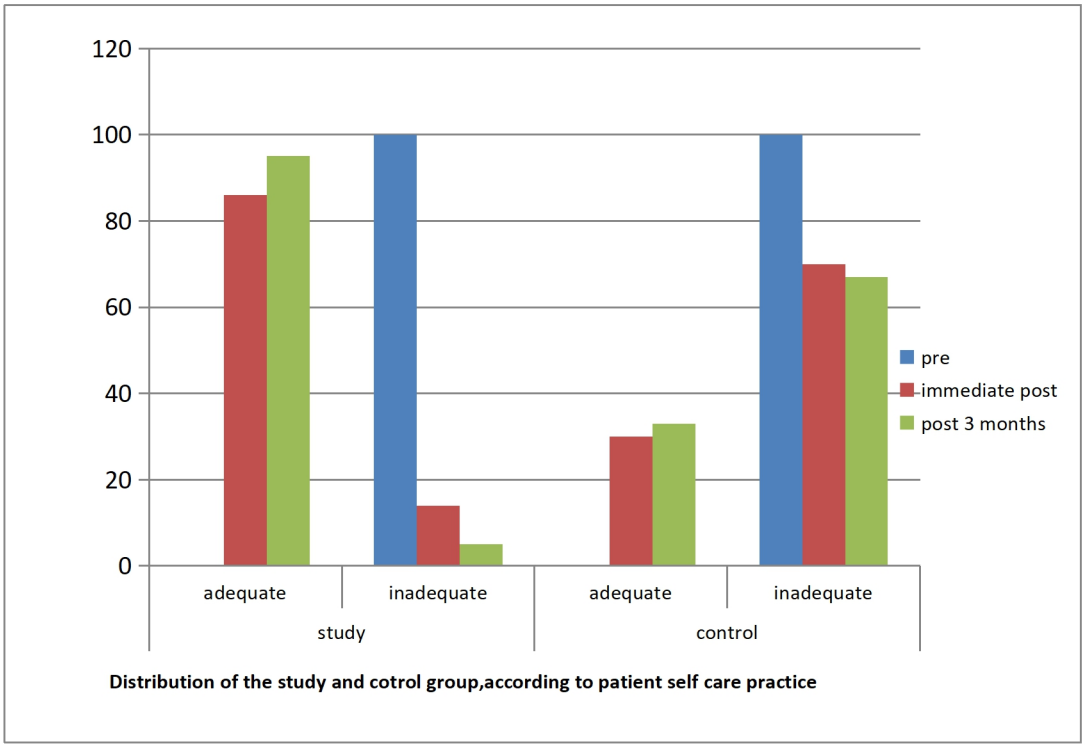

Table (4): Mean difference and partial Eta Squared of patients' knowledge in the study and control group regarding keratoplasty and keratoplasty postoperative care throughout the program intervention

Patients knowledge (I)Factor 1	Factor (J)1		(N=60)							
			Study No= (30)				Control No= (30)			
			M-D(I-J)	Sig	P	Partial Eta Squared	MD(I-J)	Sig	P	Partial Eta Squared
Eye anatomy	Pre	2	5.80	0.00**	f = 180.99 (P= 0.00**)	86%	0.10	0.81	f = 1.78 (P= 0.18)	6 %
		3	4.20	0.00**			0.53	0.07		
	Immediate post	3	1.60	0.00**			0.63	0.11		
Keratoplasty	Pre	2	6.73	0.00**	f = 226.72 (P= 0.00**)	89 %	0.20	0.60	f = 4.03 (P= 0.02*)	12 %
		3	4.23	0.00**			0.76	0.04*		
	Immediate post	3	2.50	0.00**			0.96	0.01*		
Postoperative care after keratoplasty	Pre	2	33.83	0.00**	f = 917.04 (P= 0.00**)	97 %	2.33	0.01*	f = 3.46 (P= 0.04*)	11%
		3	26.96	0.00**			1.13	0.23		
	Immediate post	3	6.86	0.00**			1.20	0.20		
Pre discharge instruction	Pre	2	21.60	0.00**	f = 769.98 (P= 0.00**)	96 %	0.67	0.28	f = 1.84 (P= 0.17)	6%
		3	17.93	0.00**			0.57	0.40		
	Immediate post	3	3.66	0.00**			1.23	0.07		
Overall Knowledge	Pre	2	67.96	0.00**	f = 2140.58 (P= 0.00**)	99 %	3.30	0.00**	f = 5.80 (P= 0.06)	17 %
		3	53.33	0.00**			0.73	0.60		
	Immediate post	3	14.63	0.00**			4.03	0.01*		

P: P-value for **Repeated measure ANOVA test** for comparing between before operation and each other period for every item in each group.

*: Statistically significant at $P \leq 0.05$

Period of program implementation (preprogram, 2 = Immediate post & 3= post three months)

M/D : Mean Difference (i-j) between each other period for every items in each group

Partial Eta Squared measuring the effect size of the program

Table (5): Mean difference and partial Eta squared between the study and control group, according to the patient's self-care practice related to postoperative care of keratoplasty throughout the program intervention.

Practice (I)Factor 1	Factor (J)1		(N=60)							
			Study No= (30)				Control No = (30)			
			M-D(I-J)	Sig	P	Partial Eta Squared	MD(IJ)	Sig	P	Partial Eta Squared
Medication management	Pre	2	8.53	0.00**	f = 128.81 (P= 0.00**)	82 %	3.06	0.00**	f = 14.47 (P= 0.00**)	33%
		3	13.03	0.00**			2.83	0.00**		
	Immediate post	3	4.50	0.00**			0.23	0.61		
Eye care Postoperative	Pre	2	5.66	0.00**	f = 76.25 (P= 0.00**)	72%	2.70	0.00**	f = 29.02 (P= 0.00**)	50%
		3	8.96	0.00**			4.70	0.00**		
	Immediate post	3	3.30	0.00**			2.00	0.00**		
Precautions followed postoperatively	Pre	2	13.76	0.00**	f = 825.34 (P= 0.00**)	97 %	7.96	0.00**	f = 86.53 (P= 0.00**)	75 %
		3	17.90	0.00**			4.46	0.00**		
	Immediate post	3	4.13	0.00**			3.50	0.00**		
A.D.L	Pre	2	18.13	0.00**	f = 345.01 (P= 0.00**)	92 %	5.43	0.00**	f = 42.71 (P= 0.00)	60 %
		3	26.76	0.00**			6.26	0.00**		
	Immediate post	3	8.63	0.00**			0.83	0.08		
Diet modification	Pre	2	9.80	0.00**	f = 704.42 (P= 0.00**)	96 %	2.60	0.00**	f = 12.27 (P= 0.00**)	30 %
		3	14.63	0.00**			2.50	0.00**		
	Immediate post	3	4.83	0.00**			0.10	0.77		
Follow- up	Pre	2	7.43	0.00**	f = 774.22 (P= 0.00**)	96%	1.63	0.00	f = 8.45 (P= 0.00**)	23%
		3	9.23	0.00**			0.73	0.13		
	Immediate post	3	1.80	0.00**			0.90	0.05		
Overall Practice	Pre	2	63.33	0.00**	f = 1020.03 (P= 0.00**)	97 %	11.86	0.00**	f = 21.28 (P= 0.00**)	42%
		3	90.53	0.00**			6.43	0.00**		
	Immediate post	3	27.20	0.00**			5.43	0.00**		

P: P-value for **Repeated measure ANOVA test** for comparing between before operation and each other period for every item in each group.

Period of program implementation (preprogram, 2 = Immediate post & 3= post three months)

*: Statistically significant at P ≤ 0.05 M/D : Mean Difference (i-j) between each other period for every items in each group

Partial Eta Squared measuring the effect size of the program

Table (6): Comparison between the study and control groups in relation to presence of post -operative keratoplasty complications or problems.

Post -operative keratoplasty complications or problems.		(N=60)								significance test	
		Study (No=30)				Control (No=30)				P1	P2
		Immediate post		Post 3months		Immediate post		Post 3months			
		No	%	No	%	No	%	No	%		
Complications related to wound closure	Absent	30	100.00	30	100.00	30	100.00	30	100.00	χ^2=0.000 P=.1.000	χ^2=0.000 P=.1.000
Suture-related complications	Absent	28	93.30	30	100.00	25	83.30	23	76.70	χ^2=1.456 P=.228	χ^2 =7.925 P=.005
	Present	2	6.70	30	100.00	5	16.70	7	23.30	χ2=8.086 P=.004	
Intraocular pressure-related complications	Absent	25	83.30	30	100.00	23	76.70	22	73.30	χ^2=.417 P=.519	χ2=9.231 P=.002
	Present	5	16.70	0	0.00	7	23.30	8	26.70	χ^2=.6.00 P=. 014	
Complications related to infections	Absent	27	90.00	30	100.00	24	80.00	21	70.00	χ2=1.176 P =.278	χ2=10.588 P=.001
	Present	3	10.00	0	0.00	6	20.00	9	30.00	χ^2=.9.412 P =.002	
Complications related to epithelial healing	Absent	30	100.00	30	100.00	30	100.00	30	100.00	χ^2=0.000 P=.1.000	χ^2=0.000 P=.1.000.
Choroidal detachment and hemorrhage-related complications	Absent	30	100.00	30	100.00	30	100.00	30	100.00	χ^2=0.000 P=.1.000	χ^2=0.000 P=.1.000

χ2: Chi-square test
*: Statistically significant at P ≤ 0.05

Discussion:

Keratoplasty remains the ultimate treatment for corneal blindness and corneal diseases. It is primarily aimed at visual rehabilitation and is considered one of the most common transplanted tissues world wide. The restoration of sight is the most important purpose of corneal grafting. The criteria for operation success is primarily depend on the indication of surgery, pain relief, and maintenance of the structural integrity of the eye **(Fasolo, et al. 2012)**. Since successful corneal transplantation improves both health and lifestyle of patients, their personal feelings and considered as a central issue in their overall assessment**.** Indeed, ophthalmic nurses play a crucial role in achieving required postoperative outcomes if they provide comprehensive, standardized, and systematic nursing care pre, and post eye surgery. So, nursing management is an important and potentially powerful tool that can have beneficial effects as improvement in patient knowledge, self-care, quality of care, cost reduction, transparency of treatment **(Hinkle ,et al., 2018 & Cruz, et al., 2019).**

In the light of this, nurses' performance must cover all surgical periods, from the indication of the transplantation to the patient's discharge. This appointment enables identifying risk factors, comorbidities, therapeutic adherence, and adequate use of medications, physical ophthalmologies examination, and control of modifiable risk factors and consequently improving grafts quality and transparency for a longer time and avoiding possible complications decreasing length of hospital stay as well as positively influencing recovery **(Sommers, et al., 2015& Yoost , et al.,2015)**. Consequently, health teaching program for patients after surgery increase adaptation, improve the cooperativeness and help the patient to improve self-care. Up to the researchers' knowledge, no study done to examine the effect of implementing the teaching program on health status outcomes for patients undergoing keratoplasty . The present study tested the hypothesis that the implementation of the teaching program will lead to statistically significant improvement in postoperative health status outcome in patients and this would lead to better visual function with controlling postoperative complications of keratoplasty ,improved level of self care practice and independence in performing activities of daily living. The findings generally lead to acceptance of this hypothesis given the shown improvements in postoperative health outcome with consequent improvement in visual function and controlling postoperative complications of the patients who had their keratoplasty.

In the present study revealed that most of the study and the control group patients were in the age group ranging from 40 to less than 65 years. Also, there was a predominance of male in both the study and the control groups.It is justified that, the large number of elder adult patients had an ulcer and bullous keratopathy, and young patients had keratoconus, As it was found that these factors are the climatic condition , patients' socioeconomic level, education level, safety at work place, prevalence of ocular surface diseases and ophthalmic medication abuse exposure that triggered contact lens intolerance and consequently a need for earlier surgical intervention. This results are nearly consistent with those obtained by (**Fasolo, et al., 2012 & Jamali, et al., 2019)** who reported that 588 male and 368 female subjects who underwent corneal transplantation and mean age group were 49.0 ±19.8 years that an infected corneal ulcer was the most common indication for keratoplasty. The present results differ from obtained by (**Al-Arfai ,et al,. 2015& Amiri ,et al., 2017** who found that the majority of the patients who underwent keratoplasty were less than 40 years with a mean age of 27.5 years and indication for keratoplasty was keratoconus. Also,**Zare, et al.,2012** reported that the leading indication for corneal transplantation was keratoconus, but bullous keratopathy was the second most common indication, followed by non-herpetic corneal scar and infectious corneal ulcers.

In relation to patient's knowledge about postoperative care of keratoplasty, the findings of the present study revealed that there was a high statistically significant improvement in the studied patients knowledge about definition, causes, signs & symptoms of

corneal disease, keratoplasty surgery, complications or problems and total knowledge score immediately after the interventional program. This improvement declined after three months, but was still more significant than the preprogram. The high statistically significant improvement post program implementation might be due to several reasons, such as helping the patients to remember how to care for their eye ,changing eye dressing and the administration of eye medication by giving them the colored booklet, better communication with patients and explaining to each patient how to perform eye care and how to instill eye drops is also helpful in this respect. It also emphasized the importance of reinforcing the patient's knowledge. These results were similar to (**Khatab., 2012,Mohamed ,et al., 2019 and Vaishali, et al., 2019),** who mentioned that there is a significant difference between the mean pre-test and post-test knowledge, indicating a statistically significant improvement in knowledge of the subjects after the individualized health teaching. Furthermore, this finding was in harmony with a study at Ain-Shams University Hospitals by (**Belal ,2004)** who reported that, the majority of the patients had an unsatisfactory level of knowledge about anatomy and physiology of the eye preoperative.

In this respect**, (Fasolo ,et al., 2012)** pointed that no one can neglect the importance of preoperative knowledge as well as postoperative nursing care for patient with corneal transplantation that includes awareness of signs and symptoms of possible complications. Furthermore, this finding was reported by **(Rosdable, et al.,2011)** who mentioned that patient teaching is important because the patient has the right to know and to be informed about diagnosis, prognosis of illness, treatment options, risks associated with the treatments.

Regarding post-operative self care practice of how to care for their eye, changing eye dressing and the administration of eye medication, ADL and diet modification, in the preoperative and postoperative period was improved significantly in the study group after three months of implementing the teaching program compared with the control group. This result is supported by (**Daniel, et al., 2010, and Khatab., 2012)**, who concluded that understanding of the technique of eye care as hand washing before and after touching the cleaning the eye from the inside as well as removing, trimming finger nails, and improve patients' outcome. This is in congruent with **(Nettina et.al, 2014 and Taylor, et al.,2015)** who state the technique of the administration of eye medication, such as checking the medication label before instilling it, washing hands before the administration medication, tilting patient head slightly or placing it in supine position, applying one or so drops in each eye, waiting from 1-2 minutes before applying other medication, and patting skin with clean tissue to absorb excess medication and finally increasing the effectiveness of medication used. These findings are in line with **(Rho, et al., 2012 and El Shafaey & Basal, 2018)** who found that a higher score on the postoperative self-care compliance, especially regarding the care of hygiene, protection of operation side, activity of daily living (ADL) and eye drop administration. Moreover, **(Borderie, et al., 2009)** stated that patient compliance with treatment enhance long term success of this operation.

Furthermore, the findings revealed that there was significantly after the implementation, teaching program self care practice of the study group patients concerning postoperative precautions such as avoid touching the operative eye, avoid lifting, push or pull heavy objects and avoid rubbing of the eye, wear an eye shield when showering and during sleep has increased after program than the control group. More elaboration, the result of this study specified that there were no a statistically significant difference between study and control group pre implementing of teaching program related to all items of self care practice, but it was improved among the study group in the immediate postoperative from program implementation. Also, there was statistically significant improvement among the study group than control group regarding total self care practice after implementing program this might be due to health instruction given to study patients using different teaching strategies as lecture, discussion, and colored booklet. Theses findings are supported

by(Khatab.,2012 & El Shafaey & Basal , 2018)declared that postoperative precautions as avoiding sleeping on the affected side, avoiding rubbing and sneezing the eye, avoiding getting soap near the eye and wear an eye shield was improved patient education.

Stephen, 2018 reported that early complications include wound leak, persistent epithelial defect, suture problems, filamentary keratopathy, elevated intraocular pressure, choroidal hemorrhage, microbial keratitis, endophthalmitis, whereas late complications were epithelial down growth, refractive error, graft rejection and glaucoma. Also, **(Dodia, et al., 2014)** illustrated that there was a persistent epithelial defect, graft rejection, mainly endothelial type late graft rejection, and secondary glaucoma was the most common complications. In this context, **(Sharma, et al., 2014)** who found that glaucoma and elevated intraocular pressure following penetrating keratoplasty (PK) is one of the most common causes for irreversible visual loss and the second leading cause for graft failure after rejection. In the light of this, the result of the present study clarified that there was a statistical significant decrease in the number of patients who had complications in the study group than in the control group postoperative period. The study highlights the necessity to evaluate studied patients of keratoplasty over a subsequent period of follow up for any signs of complications and to manage the complications as early as possible.

Although, several researchers have studied this area such as **(Nassar ,et al., 2014)** who study assessment and evaluation of visual acuity, indications, and complications after penetrating keratoplasty. Also, **(Bamashmus ,et al.,2017)** on his study about emergency visits after corneal transplantation in Yemen. **Cruz, et al., 2019** for his research on clinical and surgical factors and intraoperative complications in patients who underwent penetrating keratoplasty**.** The research of **Amiri et al. 2017** about corneal transplantation: A new view of life.More and more, **Armitage ,et al., 2019** on their study of high-risk corneal transplantation: recent developments and future possibilities, outcomes and potential predictors: A Systematic Review. **Vaishali ,et al., 2019** on their research about study of visual outcome in patients undergoing penetrating keratoplasty. **Thomas,et al., 2015** on their research about a clinical study on visual outcome and complications of penetrating keratoplasty. On the other hand, **Lockey ,2009** in his study focused on the importance of providing the patient with verbal and written information pre eye surgery to assist him to be more physically and psychologically prepared. In addition, **(Jie ,et al. ,2016)** stressed on the role of ophthalmic nurses in providing health teaching to the patients preoperatively to enable them to cooperate better with medical and nursing staff and to facilitate the treatment during hospitalization and at rehabilitation stage. But, up to the researcher knowledge, no study done to evaluate the effect of teaching program on postoperative health outcomes for patients undergoing keratoplasty.

Finally, the present study is bridging the gap between clinical practice and research in order to translate research findings and apply best evidence into practice. Additionally, the obtained results show the evidence that a well-planned teaching program carried out to patients undergoing keratoplasty could be successful in improving postoperative health outcomes such as an improved visual function with controlling of postoperative complications, or problems and improved level of self care practice So, Patients undergoing keratoplasty who receive a teaching program exhibit improvement in postoperative health outcomes than those who do not.

Conclusion:

In the light of the study findings, it can be concluded that there was no statistically difference between control and study group patients in relation to patients sociodemographic data, while there was a high significant mean scores in each item of knowledge of the study group patients as compared to the control group, immediately post and post three months of program implementation . Also, self-care practice was improved significantly in the study group patients after three months of implementing the teaching program compared with the control group. Most of the study group patients had minimal post-operative complications after

application of teaching program than the control group.

Recommendation:

Based on the findings of the present study, the following recommendations are to be considered:

- Establishment of a continuous health education programme at the ophthalmology department to deliver health education to each patient through the use of a booklet and illustrated pamphlets.
- Providing a written instruction booklet to patients prior to discharge is critical in reducing postoperative complications
- One member of the family should be taught in eye care and the proper administration of eye medications to help the patient follow the instructions and improve their prognosis.
- Increase the patient's awareness about the importance of periodic checks up to prevent developing any complications which can effect on the quality of life.
- It is recommended that similar studies should be replicated on longitudinal bases that large sample size and with long term follow up can help in generalized the results.
- Ophthalmic nurses should receive periodic in-service training programs to improve, update, refreshing their knowledge and practice regarding keratoplasty surgery (pre&postoperative care)

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