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Effect of Enhanced Recovery Program on Clinical Outcomes for Patients Undergoing Keratoplasty

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Abstract: **Background**: Keratoplasty is the most common form of solid-organ transplantation performed worldwide. Nurses play a vital role in preventing or controlling post-operative complications post keratoplasty though providing enhanced recovery program. **Purpose**: To evaluate the effect of enhanced recovery program on SELECTED clinical outcomes for patients undergoing keratoplasty. **Design**: A quasi experimental research design (pretest posttest) was utilized. **Setting**: This study carried out at Al-Ramed hospital and the Ophthalmology department at Menoufia University Hospital in Shebin El-Kom, Menoufia Governorate, Egypt. **Sampling**: A consecutive sample of 66 adult patients were selected and divided alternatively into two equal groups. **Instruments**: structured interview questionnaire, visual function index 14 and Patient's Health Outcomes. significant improvements of self care practices among study group than control group **Conclusion**: implementing the enhanced recovery program on patients undergoing keratoplasty improved patient's knowledge, visual function, enhancing their self- care practice as well as preventing and managing complications. **Recommendation**: patient education centers should be establihed in the ophthalmology department to provide information to patients before performing the keratoplasty as well as patients as well as replication of the current study on larger probability sample at different settings to increase generality ability of study

***Key words**: clinical outcomes, keratoplasty, recovery program*

Introduction:

Corneal diseases are important public health problems that responsible for visual impairment and blindness in about 12% and 4% of blindness in Egypt and worldwide respectively. Error of refraction, glaucoma, cataract,

ocular trauma and chemical injuries and macular degeneration related to age are most common causes of corneal blindness (6 to 8 millions) globally (Senosy et al., 2023).

Corneal transplantation (Keratoplasty) is one of the most successful types of tissue graft around the world that replacing a damaged cornea with a healthy one. Keratoplasty is considered a standardized management for visual impairment caused by corneal disorders. (Zhao et al., 2022).

The most dangerous keratoplasty complications after surgery are infection and transplant rejection. The survival rate of corneal grafts is 90% at 5 years and 82% at 10 years, with reported allograft rejection rates following penetrating keratoplasty ranging from 5% to 18% (Anitha et al., 2022). Foreign body sensation, pain and photophobia are common symptoms for other complications as increased intraocular pressure, wound leakage and suture-related complications (Ahmed, et al., 2021).

Nurses play a vital role in preventing or controlling post-operative complications. This can be achieved by enhanced recovery program. It is a recent program, which assists patients to improve quickly post considerable operation. It is evidence based that has been confirmed to decrease the risk of complications. Enhanced recovery program is a bundle of care that covers the whole journey from the decision of surgery until back to home for recovery(Memtsoudis et al., 2020).

Nurses' performance in enhanced recovery program cover all surgical periods, from decision for transplantation to the patient's discharge. Preoperative care includes providing patients with comprehensive information about keratoplasty and preparing the patients physically and emotionally for surgery. Additionally, postoperative care management, including the proper timing and administration of topical eye drops aim to empower individuals with better self-care behaviors, achieve the best possible visual outcomes and decrease postoperative complications (Tupcharoen et al., 2024).

Patient's counseling about on-date follow-up and self-care is an important part of enhanced recovery program. The nursing role is vital to describe the appropriate eye instillation technique, wearing eye glasses to protect eye from injury, avoiding strenuous activity such as sports and lifting heavy objects (>20kg) or bending over for two weeks after surgery to prevent increasing intraocular pressure. In addition, healthy diet is very important aspect of enhanced recovery program especially brightly colored vegetables, which are full of vitamins A and C. These foods can protect eyes from disease and infection especially carotenoids, (Zafar et al., 2020&Anitha et al., 2022).

Significance of the study

Keratoplasty has been evolved rapidly during the last few decades with serious postoperative complications. The most common complications are endothelial rejection (17.3%), followed by glaucoma worsening (15.5%), bacterial keratitis (5.8%), persistent epithelial defects (3.4%), and wound dehiscence (1.6%) (Al-Sharif &Alkharashi., 2021).

In Egypt, the most corneal transplants are done with corneas imported from the United States. In Assuit University Hospital around 150 corneal transplants were performed from August 2017 to April 2019 (Ahmed et al., 2021).While at Al-Ramed Hospital and Ophthalmology department at Menoufia University hospital around 50 cases of corneal transplants were performed from January 2022 to December 2023 based on hospital reports (Statistics of Al-ramed and Ophthalmology department at Menoufia University, 2023).

Because there are little studies that indicate effect of enhanced recovery program on clinical outcomes for patients undergoing keratoplasty, so it is hoped that the current study will give evidence based research to evaluate the effect of enhanced recovery program on clinical outcomes for patients undergoing keratoplasty.

Purpose of the study

The purpose of the current study was to evaluate the effect of enhanced recovery program on clinical outcomes for patients undergoing keratoplasty.

Research Hypotheses

- Keratoplastic patients having keratoplasty surgery who receive enhanced recovery program (study group)
- The postoperative complications of patients having keratoplasty surgery who receive enhanced recovery program (study group) was fewer than for those who don't (control group).
- Self-care practices of patients having keratoplasty surgery who receive enhanced recovery program (study group) are higher than for those who don't (control group).

Methods

Research design:

A quasi experimental research design (pretest and posttest) was utilized to conduct this study.

Setting:

The current study was carried out at Al-Ramed hospital and the Ophthalmology department of Menoufia University Hospital in Shebin El-Kom, Menoufia Governorate, Egypt.

Sampling

A consecutive sample of 66 adult patients was selected. The researcher used the sample size calculator with a confidence level of 95%, margin error 8%, population proportion 50% and population size 100,. The sample size was determined to be 61 cases. and was increased to 66 patients to restore the attrition rate.Patients were divided randomly and alternatively into two equal groups (33 for each of study and control groups).

Study group (I):

received enhanced recovery program along with routine hospital care.

Control group (II):

received only the routine hospital care such as eye`s medications, cover the eye with eyea gauze pad, eyepatches and a rigid metallic or plastic eye shield.

Patients were chosen according to the following criteria:

- Adult patients (21 - 60 years old).
- Free from cognitive impairment to be able to follow the enhanced recovery program.
- Free from systemic disease such as endocrine disorders (diabetes and graves' disease) to avoid its effect on results of study.

Instruments of the study

Instrument one: -Characteristics of patients structured interview questionnaire

This instrument was developed by the researchers based on reviewing of relevant literature review (El-Desoky&Awad, 2020) to assess biosociogemographic data and covered the following two parts.

- **Part1: - personal characteristics**: it included questions about patient's age, sex, marital status, level of education, occupation, place of residence and perceived monthly income.
- **Part 2: - Medical data**: It included 5 questions about past occular and family history, present ocular history, ocular surgical history and risk factors of ocular disease.

Instrument two: Visual function index 14:

This instrument was developed by Steinberg et al., (1994) and was adopted bythe researcher to measure the functional impairment of eyes after keratoplasty. It consisted of 18 questions covering 14 aspects of visual function affected by keratoplasty. Patients' responses were scored from zero to four. This value was multiplied by 25, giving total score from 0 to 100. A total score of 100 indicated the subject ability to perform all applicable activities, while zero score indicated their inability to perform all applicable activities.

Instrument three: Patient's Health Outcomes:

This instrument was developed by El-Desoky& Awad, (2020) and modified by the researcher to assess patients' complications and self-care practices after keratoplasty. This instrument consisted of two parts:

- **Part 1: Keratoplasty Complications**: It consisted of eight items to determine postoperative complications by assessing complications related symptoms such as defect of wound closure, epithelial healing, increased intraocular pressure, corneal detachment, hemorrhage, infection, graft failure, suture related complications.One score was given for the presence of a sign of postoperative complications and zero for absence. The complication was considered present if 75%or more of its manifestation was present.
- **Part 2: Self-care practices structured interview schedule**: It was utilized by researchers to assess patients' postoperative self-care practices. It included six main items about medication management, postoperative eye care, postoperative precautions, diet modifications, activities of daily living and follow

up visits. Patients' self-care practices were scored as follows: inability to practise self-care activities was given zero score, inccorrectlypractising self-care activities was given one score while correctly practising self-care activities was given two score. The total scores was summed-up and divided by the number of the items to obtain a mean score of each part. These scores were changed into a percent score. If the percent score was 60% or more, the practice was considered adequate. If it was less than 60%, the practice was considered inadequate.

Ethical considerations:

- A written approval was obtained from Ethical and Research Committee of the Faculty of Nursing, Menoufia University code number 885.
- All patients were informed about purpose, procedure, and benefits of the study, then a written consent was obtained from all of them.
- All patients were informed that participation in the study was voluntary and they could withdraw from the study at any time without penalty.
- Confidentiality and anonymity of patients was assured through coding all data and putting all papers in a closed cabinet.

Validity:

All instruments were tested for face validity by a jury of five experts of Medical Surgical Nursing and ophthalmology fields. Adjustments were completed accordingly to ascertain relevance and completeness of study instruments.

Reliability:

The first instrument (Structure interview questionnaire) was tested for reliability using test retest method. Its value was r = 0.85. The second one (Visual function index 14) was tested by Steinberg et al., (1994). The cronbach's test was 0.83.The third one (Patient's Health Outcomes) was tested by ElDesoky & Awad (2020) and found that the Cronbach's test was r=0.805.

Pilot study

A pilot study was conducted on 10 % (7 subjects) of the sample to appraise the assembled instruments for feasibility, clarity and applicability, then the essential modifications were done. The patients of pilot study were omitted from the actual sample size.

- An official letter from the Dean of Faculty of Nursing, Menoufia University explaining the purpose and method of data collection was sent to the responsible authorities of the Menoufia University and Alramed hospitals to attain their approval and written agreement for carrying out the study.
- Patients who fulfilled the inclusion criteria were assigned randomly and allocated alternatively into two equal groups (study and control groups).Each group had 33 subjects
- The data were collected from both hospitals in the morning shift in which subjects attended according to their schedule time.
- Preoperatively, the researchers collected patients' baseline data from sample using first instrument part one

and two to identify personal needs and design the appropriate recovery program and colored booklet that contains information about complications of keratoplasty as well as post-operative self-care practices after reviewing the related literature (Eldesoky & Awad, 2020; Ahmed et al., 2021;Nassar et al., 2024).

- The researchers conducted three teaching sessions for each subject of study group in the waiting area of both hospitals by using lectures, discussion, demonstration and redemonstration as follow:-
  - ❖ During the first session, the researchers met each patient the study group and gave them information about keratoplasty: definition, indications, contraindication, most common techniques and postoperative complications. This session was conducted before surgery by one week after calling each subject by phone for arranging for the meeting. The researchers distributed the prepared colored booklet before beginning of this session.
  - ❖ Second session was conducted the day before surgery. At the beginning of this session, the researchers reinforced the received information, then taught each subject of study group by demonstration how to perform eye care and eye instillation of medication before and after the operation.
  - ❖ Also the researchers instructed each patient in the study group about food that should be avoided at first days after keratoplasty such as bananas, dairy products, red meat and wheat to decrease liability for constipation to avoid increasing intraocular pressure. Moreover, patient as were told to increase foods that protect the cornea from diseases such as fish, carrots, cabbage, almonds and oranges.
  - ❖ Third session was held in the morning before the operation. At the beginning of this session , the researchers reinforced the received previous information and learnt care then provided information about the postoperative precautions that should be followed by subjects to avoid postoperative complications such as not carrying heavy objects (more than 20 kg) for two weeks , not rubbing or putting pressure on the eye for a month, protecting eye during shower and sleep by eye shield, protecting eye from soap, water, and eye make-up for two weeks. Alsopatient was instructed to avoid constipation, bending for extended time, strenuous activity for 4 -6 weeks to avoid increasing intraocular pressure.
  - ❖ Moreover researchers thought patient to maintain supine position or other side during bedtime to keep cornea in its place , practice all normal activities such as cooking and washing gradually after 10 days of the operation. Also researchers taught patient about the importance of follow–up and warning signs that required immediate medical attention such as loss of vision, pain, redness of eye, light flashes or

multiple new spots in front of the eye.

- ❖ During follow-up period, the researchers called the subjects of study group by phone daily to enhance their proper self-care at home.

- All study sample was evaluated for their visual function using second instrument by one month and three months after surgery.
- Postoperative complications and self-care practices of studied subjects were evaluated using third instrument by one week and three months after surgery.
- Comparison was done between study and control group to evaluate the effect of enhanced recovery program on clinical outcomes for patients undergoing keratoplasty.

Statistical analysis of the data:

The data collected were tabulated & analyzed by SPSS (statistical package for the social science software) statistical package version 20 on IBM compatible computer. Two types of statistics were done:

- **Descriptive statistics:**

They were expressed as mean and standard deviation (X+SD) for quantitative data or number and percentage (No & %) for qualitative data.

- **Analytic statistics:**

1) Chi-square test: For categorical variables, to compare between different groups.

2) Fisher's Exact or Monte Carlo correction: Correction for chi-square when more than 20% of the cells have expected count less than 5

3) F-test (ANOVA): For normally distributed quantitative variables, to compare between more than two groups.

Result

Table (1): It is observed that the highest percentage for the age of study group (30.3%) was between the ages 35- <55 years old, while the highest percentage among control group (39.4%) was between 25- <35 years old. More than half of study group (57.6%) and less than half of control group (45.5%) were male. More than half of study and control groups (51.5% and 63.7% respectively) were married. There were no statistical significant differences between both groups regarding all demographic characteristics.

Table (2): This table illustrates that about one-half of study and control groups (57.5% and 45.5% respectively) did not have past ocular history. Regarding presentocular history, less thantwo thirds of study and control groups (60.6% and 54.5% respectively) had keratoconus. According history of ocular surgery, less than half of study group (48.5%) and about one third of control group (30.3%) had history of glaucoma surgery. There were no statistical significant differences between both study and control groups regarding all items of medical data.

Figure (1): This figure illustrates that the mean total visual function one month post keratoplasty for study group was 35.57 ± 5.21 and 30.23 ± 4.16 for control group that was highly

significantly increased to 60.73±11.27 for study group versus 47.85±5.79 for control group after three months.

Table (3): This table presents that minority of both study and control groups complained of increased intraocular pressure (9.1% and 21.2% respectively) after keratoplasty by one week that was significantly disappeared for study group after first three months versus 9.1% of control group. Also 9.1% of both groups had infection after one week that was disappeared after three months for study group while 6.1% of control group still complained of eye infection.

Table (4): This table presents that about two thirds of study group (63.6%) versus (6.1%) of control group had adequate total postoperative self-care practices post keratoplasty by one week that was highly significantly increased to 93.9% for study group versus 6.1% of control group post keratoplasty by three months

Table (5): This table shows that there were significant relations between presence of keratoplasty complications regarding epithelial healing, increased intraocular pressure and infection with their total postoperative self-care practices after one week.

Table (6): This table shows that there were no significant relations between all keratoplasty complications and total postoperative self-care practices of control group throughout study periods (P value >0.05).

Table (7): This table shows that there was significant positive correlation betweentotal visual function and total postoperative self-care practices of study group after keratoplasty by three months (r=0.38).

Table (1): Percentage distribution of both study and control groups regarding their personal characteristics (n=66).

social characteristics	Study group (n=33)		Control group (n=33)		X^2	P-Value
	No.	%	No.	%		
Age /Year						
18- <25	7	21.2	8	24.3	2.543	0.468
25-<35	8	24.3	13	39.4		
35-<55	10	30.3	6	18.2		
55-65	8	24.2	6	18.2		
Sex						
Male	19	57.6	15	45.5	0.971	0.325
Female	14	42.4	18	54.5		
Marital status						
Single	8	24.2	10	30.3	4.310	0.230
Married	17	51.5	21	63.7		
Widowed	3	9.1	1	3.0		
Divorced	5	15.2	1	3.0		
Educational level						
Illiterate	8	24.2	6	18.2	1.918	0.751
Read and write	6	18.2	3	9.1		
Primary education	5	15.2	7	21.2		
Secondary education	6	18.2	7	21.2		
Higher education	8	24.2	10	30.3		
Occupation						
Manual work	18	54.5	18	54.5	4.821	0.090
Administrative work	5	15.2	11	33.3		
Not working	10	30.3	4	12.1		
Place of residence						
Rural area	20	60.6	23	69.7	0.601	0.438
Urban area	13	39.4	10	30.3		
Perceived monthly income						
Enough	12	36.4	16	48.5	0.992	0.319
Not Enough	21	63.6	17	51.5		

Table (2): Percentage distribution of medical data among study and control groups (n=66).

Medical data	Study group (n=33)		Control group (n=33)		X^2	P-Value
	No.	%	No.	%		
A-Past Ocular disease						
Cataract	11	33.3	12	36.4	0.067	0.796
Glaucoma	3	9.1	6	18.2	1.158	0.282
No	19	57.6	15	45.4	0.244	0.621
Family History						
Cataract	7	21.2	6	18.2	0.119	0.729
Dry eyes	6	18.2	3	9.1		
Eye sores	3	9.1	5	15.1		
No	17	51.5	19	57.6		
B- Present Ocular history:						
Keratoconus	20	60.6	18	54.5	0.804	0.402
Corneal opacity	10	30.3	11	33.3	0.070	0.792
Infectious corneal ulcers	3	9.1	4	12.1	1.000	0.500
C- Ocular surgical history						
Corneal transplant surgery	4	12.1	8	24.2	1.300	0.186
Cataract surgery	4	12.1	3	9.1	1.000	0.656
Glaucoma Surgery	16	48.5	10	30.3	1.220	0.208
No	9	27.3	12	36.3		
D- Risk factors of ocular disease						
Eye infection (bacterial, fungal, or viral)	18	54.5	16	48.5	0.243	0.622
Exposure to toxic chemicals	5	15.2	3	9.1	0.708	0.354
Eye allergies such as vernal ophthalmia	5	15.2	12	36.4	0.090	0.050
Autoimmune diseases such as Wegner's disease	2	6.1	0	0.0	0.492	0.246

Figure (1): Mean total score of visual function of eye for both study and control groups after keratoplasty by one month and three months (n=66)

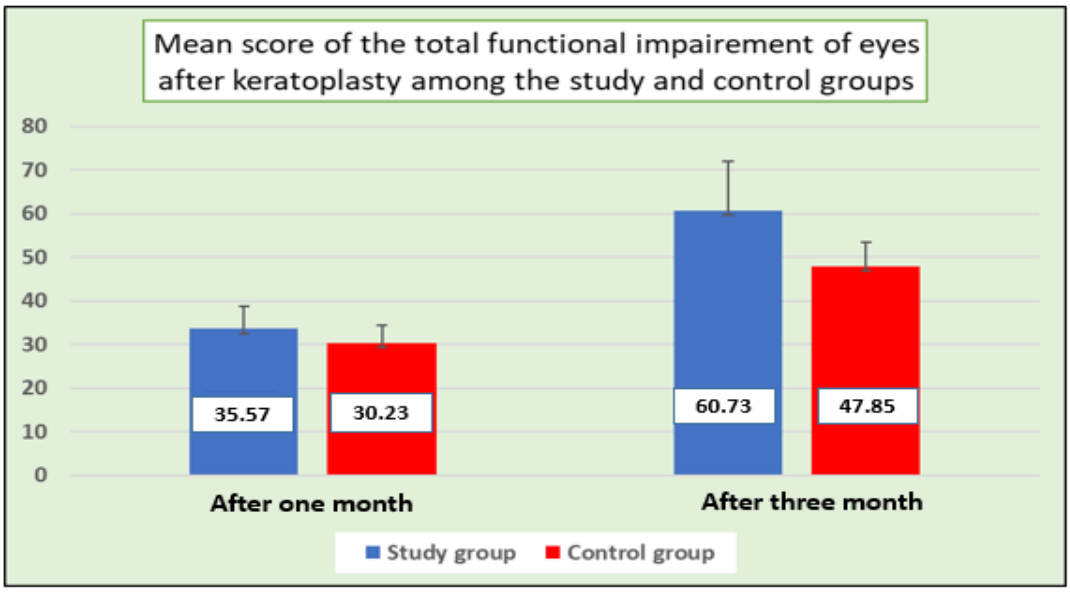

Table (3):Distribution of Patients in the Study and Control Groups according toKeratoplasty complications post keratoplasty by one week and three months (n=66)

Keratoplasty complications	Study group (n=33)								Control group (n=33)								Test of significance		
	After one week				Afterthree-months				After one week				Afterthree-months				(p_1)	(p_2)	(p_3)
	Yes		No		Yes		No		Yes		No		Yes		No				
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%			
Wound closure	31	93,9	2	6.1	33	100.0	0	00.0	28	84.8	5	15.2	29	87.9	4	12.1	**X^2=1.438 p=0.230**	**X^2=4.258 p=0.039***	**X^2=2.063 p=0.151**
Epithelial healing	29	87.9	4	12.1	33	100.0	0	00.0	33	100.0	0.0	00.0	32	97.0	1	3.0	**X^2=4.258 p=0.039***	**X^2=1.015 p=0.314**	**X^2=4.258 p=0.039***
Increased intraocular pressure	3	9.1	30	90.9	0	0.0	33	100.0	7	21.2	26	78.8	3	9.1	30	90.9	**X^2=1.886 p=0.170**	**X^2=3.143 p=0.076**	**X^2=3.143 p=0.076**
Infection	3	9.1	30	90.9	0	0.0	33	100.0	3	9.1	30	90.9	2	6.1	31	93.9	**X^2=0.000 p=1.000**	**X^2=2.063 p=0.151**	**X^2=3.143 p=0.076**
Suture related complication	1	3.0	32	97.0	0	0.0	33	100.0	0	0.0	33	100.0	1	3.0	32	97.0	**X^2=1.015 p=0.314**	**X^2=1.015 p=0.314**	**X^2=1.015 p=0.314**

x^2: Chi-square test.P: p-value.**Highly significant at p ‹ 0.01.

P_1: p value for comparing between two groupAfter one week. P_2: p value for comparing between two groupAfter three-months.

P_3: p value for comparing after one week and three-months for studu group.

NB: no one of both groups complained of corneal detachment, hemorrhage and graft failure after keratoplasty by one week and three months.

Table (4): Distribution of Patients in the Study and control groups according to Their Level ofPostoperative Self-Care Practices post keratoplasty by one week and three months

Total and subtotal postoperative self-care practices levels	Study group (n=33)								Control group (n=33)								Test of significance		
	After 1 week				After 3 months				After 1 week				After 3 months						
	Adequate		Inadequate		Adequate		Inadequate		Adequate		Inadequate		Adequate		Inadequate		(p_1)	(p_2)	(p_3)
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%			
Administration of eye drop	10	30.3	23	69.7	31	93.9	2	6.1	0	0.0	33	100.0	0	0.0	33	100.0	X^2=11.78 p=0.001**	X^2=58.45 p=0.000**	X^2=28.39 p=0.000**
Application of eye ointments	4	72.7	9	27.3	29	87.9	4	12.1	2	6.1	31	93.9	2	6.1	31	93.9	X^2=30.71 p=0.000**	X^2=44.34 p=0.000**	X^2=2.395 p=0.122
Postoperative eye care	17	51.5	16	48.5	28	84.8	5	15.2	2	6.1	31	93.9	2	6.1	31	93.9	X^2=16.62 p=0.000**	X^2=41.31 p=0.000**	X^2=8.451 p=0.004**
Postoperative precautions	33	100.0	0	0.0	33	100.0	0	0.0	2	6.1	31	93.9	8	24.2	25	75.8	X^2=58.45 p=0.000**	X^2=40.24 p=0.000**	X^2=0.000 p=1.000
Diet modifications	29	87.9	4	12.1	27	81.8	6	18.2	0	0.0	33	100.0	0	0.0	33	100.0	X^2=51.73 p=0.000**	X^2=45.69 p=0.000**	X^2=0.471 p=0.492
Activities of daily living	31	93.9	2	6.1	33	100.0	0	0.0	18	54.5	15	45.5	32	97.0	1	3.0	X^2=13.39 p=0.000**	X^2=1.015 p=0.314	X^2=2.063 p=0.151
Follow up visits	33	100.0	0	0.0	33	100.0	0	0.0	33	100.0	0	0.0	33	100.0	0	0.0	X^2=0.000 p=1.000	X^2=0.000 p=1.000	X^2=0.000 p=1.000
Total postoperative self-care practices	21	63.6	12	36.4	31	93.9	2	6.1	2	6.1	31	93.9	2	6.1	31	93.9	X^2=24.09 p=0.000**	X^2=50.97 p=0.000**	X^2=9.066 p=0.003**

X2: Chi-square test. **Highly significant at p ‹ 0.01.

P1: p value for comparing between two group After one week. P2: p value for comparing between two group After three-months.

P3: p value for comparing after one week and three-months for study group

Table (5):Relation between keratoplasty complications among study group and their total postoperative self-care practices after one week (n=33).

Keratoplasty complications		Levels of total postoperative self-care practices after one week				FET	P-Value
		Adequate (n=21)		Inadequate (n=12)			
		No.	%	No.	%		
Wound closure	Yes	21	100.0	10	83.3	1.000	0.500
	No	0	0.0	2	16.7		
Epithelial healing	Yes	21	100.0	8	66.7	0.086	0.022*
	No	0	0.0	4	33.3		
Increased intraocular pressure	Yes	0	0.0	3	25.0	0.075	0.025*
	No	21	100.0	9	75.0		
Infection	Yes	0	0.0	3	25.0	0.075	0.025*
	No	21	100.0	9	75.0		
Suture failure	Yes	0	0.0	1	8.3	1.000	0.523
	No	21	100.0	11	91.7		

NB: no one of study group had keratoplasty complication after three months

Table (6):Relation between keratoplasty complications among control group and their total postoperative self-care practices after keratoplasty by one week and three months

Keratoplasty complication		Levels of total postoperative self-care practices after one week				FET	P-Value	Levels of total postoperative self-care practices after three months				FET	P-Value
		Adequate (n=2)		Inadequate (n=31)				Adequate (n=2)		Inadequate (n=31)			
		No.	%	No.	%			No.	%	No.	%		
Wound closure	Yes	2	100.0	26	83.9	1.000	0.716	0	0.0	4	12.9	1.000	0.769
	No	0	0.0	5	16.1			2	100.0	27	87.1		
Epithelial healing	Yes	2	100.0	31	100.0	0	0	0	0.0	1	3.2	1.000	0.939
	No	0	0.0	0	0.0			2	100.0	30	96.8		
Intraocular pressure	Yes	1	50.0	6	19.4	0.384	0.384	0	0.0	3	9.7	1.000	0.824
	No	1	50.0	25	80.6			2	100.0	28	90.3		
Infection	Yes	1	50.0	2	6.5	0.176	0.176	0	0.0	2	6.5	1.000	0.881
	No	1	50.0	29	93.5			2	100.0	29	93.5		
Suture failure	Yes	0	0.0	0	0.0	0	0	0	0.0	1	3.2	1.00	0.939
	No	2	100.0	31	100.0			2	100.0	30	96.8		

FET: Fisher exact test. (*) Statistically significant at p<0.05.

Table (7):Correlation between total vision function of eyes among study and control groups and their postoperative self-care practices after keratoplasty by one week and three month (n=33).

Group	Variables	Total postoperative self-care practices			
		After one week		After three months	
		R	P- value	r	P- value
Study group	Total visual function of eyes	0.043	0.810	0.381	0.029*
Control group	Total visual function of eyes	0.180	0.316	0.109	0.547

r= Correlation coefficients test.(*) Statistically significant at p<0.05.

Discussion

keratoplasty is the single management to reestablish vision. It means replacing of corneal tissue with a healthy one because of destruction to the cornea by disorders cause deterioration of its transparency or shape(Genç et al., 2024). Enhanced recovery program after keratoplasty considered a central part in attaining the desired postoperative outcomes. It delivers inclusive, identical, and organized nursing care pre and post keratoplasty. So, nursing management is a significant and influential tool in improving patient knowledge, self-care, quality of care as well as reducing postoperative complication (El-Desoky& Awad, 2020)

For vision function, results revealed that mean total visual function was highly significantly increased among study group post keratoplasty by one month and three months than control group. This result agreed with Wróblewskaet al., (2024) who studied "outcomes of Boston keratoprosthesis type I implantation in Poland" and reported that a statistically significant improvement in visual acuity was observed at post intervention as compared to pre intervention. Also this finding also was consistent with Jha et al., (2021) who studied" visual outcomes and quality of life post-keratoplasty at a secondary center in North India" and stated that there was a statistically significant improvement among vision among study group at post intervention than control group. From the researcher point of view, the education given to study group about eye care, and food regime helped in enhancement of patient's self-care, preventing eye infection, reducing intra occular pressure that lead to more ever improving patient's visual function. These results supports study hypothesis number 2 that keratoplastic patients who receive enhanced recovery program (study group) will have better visual function than patients who don't (control group).

For Post keratoplasty Complications,

the findings of present study illustrated that minority of both study and control groups complained of increase intraocular pressure and eye infection after keratoplasty by one week that was disappeared for study group and slightly decreased among control group after first three months. This finding disagrees with Janiszewska-Bil et al.,(2021) who conducted study about "comparison of long-term outcomes of the lamellar and penetrating keratoplasty approaches in patients with keratoconus" and found that the most common early complication that appeared postoperatively was increased intraocular pressure. Also Durgam et al., (2021)

studied "outcomes of keratoplasty in a cohort of Indian patients with xeroderma pigmentosum", concluded that graft failure was the most common complication in studied sample. This disappearance of this complication during follow up showed the importance of enhanced recovery program. These results supports the third study hypothesis that postoperative complications of keratoplastic patients who receive enhanced recovery program (study group) will be fewer than for patients who don't(control group).

In relation to self-care practices,

the present study found that postoperative self care practice was highly significantly better among study group than control group post keratoplasty by one week and three months. This result approved with Mohamed et al., (2023) who studied " effectiveness of the preoperative educational guidelines for patients undergoing cataract extraction Surgery and intraocular Lens implantation", and presented that there were highly statistical significant differences between pre & post implementation of the educational guidelines in patients' self-care practices regarding eye drops, hygiene, protection of the operation site, daily life activities and follow up. Also, this result was inconsistent with Mahfouz et al (2019) who studied "effect of post cataract surgery discharge instructions on reducing eye infection among elderly patients in Egypt and reported that the majority of studied patient adhered to the postoperative self-care instructions. The improvement of self care practices among the study group after implementing the program could be due to health instruction given to study patients that increased patient's knowledge and led to improve self care practices.

Relation between keratoplasty complications among study group and their total postoperative self-care practices after one week .The finding of present study revealed that there were significant relations between presence of keratoplasty complications regarding epithelial healing, increased intraocular pressure and infection with their total postoperative self-care practices after one week. This may be explained by proper self care after keratoplasty lead to decrease or prevent postoperative complications.

Correlation between total visual function of eyes among study and control groups with their postoperative self-care practices after keratoplasty by one week and three months.

The finding of present study revealed that there was significant positive correlation between total visual function and total postoperative self-care practices of study group after keratoplasty by three months.This finding agreed with Eldesoky & Awad (2021) who reported that the improved postoperative visual function with managing postoperative complications of keratoplasty led to improved level of independence and self care practice.

Conclusion

Implementing the enhanced recovery program on patients undergoing keratoplasty improved patient's visual function, enhancing their self- care practice as well as preventing and managing postoperative complications.

Recommendations

Repetition of the existing study on bigger probability sample in other settings was required to test the generalizability of the study

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