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Original Article

Impact of Educational Program on Post-operative Health Outcomes for Patients Undergoing Keratoplasty

Shaymaa Elsayed Mossad Mohammed[1], Sara Talat Ramadan Sayed Ahmed[2], Aml Ahmed Mohammed ELmetwaly[3]*

[1]Lecturer, Medical Surgical Nursing, Medical Surgical Nursing Department, Faculty of Nursing, Mansoura University, Egypt.
[2]Fellow of Medical Surgical Nursing, Student hospital, Mansours University, Egypt.
[3]Assisstant professor, Medical Surgical Nursing, Medical Surgical Nursing Department, Faculty of Nursing, Mansoura University, Egypt.

***Corresponding author: Aml Ahmed Mohammed ELmetwaly**

Email: amlelmetwaly86@mans.edu.eg

ABSTRACT

Background: Keratoplasty or corneal transplantation is a common procedure for restoring vision in patients with corneal diseases. Despite its success, effective post-operative care is essential to prevent complications. Inadequate patient knowledge and improper self-care can negatively impact outcomes. **Aim**: This study aimed to evaluate the impact of educational program on post-operative health outcomes in patients undergoing keratoplasty at the Ophthalmology Center, Mansoura University, Egypt. **Methods**: A quasi-experimental design was used involving 40 adult patients who undergoing corneal transplantation. **Tools:** Two tools were used for data collection; the first tool was two sections involved; Patient Demographic parameters, and Keratoplasty Knowledge Questionnaire, the second tool is Patient's Health Outcomes Questionnaire: This tool, which has two sections; Post-Operative Keratoplasty complications or Problems, and Self-Care Practices Questionnaire. Validity and reliability of tools were ensured through pilot testing and expert review. **Results:** Post-intervention results indicated significant improvements in patient knowledge ($p < 0.001$). Adherence to self-care practices better attained ($p < 0.001$). Post-operative complications decreased significantly including symptoms of foreign body sensation were reported ($p < 0.05$), photophobia decreased and reported pain significantly ($p < 0.05$). **Conclusion**: Significant improvements in postoperative outcomes were attained by keratoplasty patients by increasing knowledge and improving practices when an educational program was implemented**.** **Recommendations**: Future research must attempt to include longer follow-up periods, more larger and diverse samples for determining the long-term efficacy and stability of the program's benefits.

Keywords: Educational program, Keratoplasty, Post-operative Outcomes.

Introduction

Keratoplasty is the most successful organ transplantation in the human body as cornea is devoid of vasculature. It is a useful procedure for achieving corneal clarity and improves vision in most patients. It is being done for (therapeutic, tectonic and optical) cause. Also known as corneal grafting or corneal transplantation, is a process in which dysfunctional cornea is

removed from a patient's eye and replaced with a healthy clear cornea from a donor. After Dr. Eduard Zirm's first successful human corneal graft in 1905, awareness, practice, and research on corneal transplantation have progressed rapidly. Today, the most widely done and effective transplant operation is with the establishment of eye banks (Singh et al., 2019).

According to Liu et al. (2022) and Musa et al. (2023), these disorders commonly result in irreversible vision damage, making transplantation necessary to avoid permanent blindness. Even though keratoplasty is the highest successful organ transplant procedure, there are many issues related to the matter that must be dealt with after operations. Long-standing results depend on patients adhering to complex care plans that include medication, follow-up appointments, and monitoring for problems such as graft rejection and infection (Azevedo Magalhaes et al., 2020; Djulbegovic et al., 2022).

In keratoplasty or corneal transplantation, the care given following surgery is critical to improving post-operative health outcomes. Although success rates have full-grown due to technological developments, problems including graft failure and vision loss can be dodged by patients adhering to post-operative care instructions (Li KX et al., 2022). Poor results may result from inadequate adherence to recommended procedures, such as immunosuppressive drops and preventative measures. Consequently, encouraging patient adherence and participation is needed (Krysik et al., 2018).

Around the world, 12.7 million corneal transplants are thought to be obligatory, with only one cornea reachable for every seventy individuals (Martin et al., 2020). In the United States, eye banks reported 136,130 tissue recoveries from 68,759 donors in 2019, with an insignificant declining in transplant rates compared to 2018 (Ramadan Ahmed et al., 2021). In Iran, approximately 3,000 cases are performed annually (Ali et al., 2020). The primary indications for keratoplasty include optical reasons like improving visual acuity in conditions such as pseudophakic bullous keratopathy and keratoconus (Jemberu et al., 2019). Other indications include reconstructive, therapeutic, and cosmetic purposes (American Academy of Ophthalmology, 2021).

Patient education is pivotal in fostering better outcomes by enhancing patients' understanding of their condition and care protocols. Studies in surgical contexts, including orthopaedic and cardiovascular surgeries, show that structured educational programs reduce complications and improve recovery outcomes. These programs empower patients to take an active role in their recovery, improving long-term results (Wittink & Oosterhaven, 2018; Bhattad, & Pacifico, 2022).

In ophthalmology, especially keratoplasty, patient education has gained recognition. Patients face challenges such as managing anti-rejection medications, hygiene maintenance, and

graft rejection monitoring (Malleron et al., 2022; Musa et al., 2023). Educational interventions targeting these areas can significantly improve outcomes by enhancing self-management capacities. However, research examining the impact of post-operative educational programs on keratoplasty outcomes, particularly in resource-limited settings like Egypt, remains limited (Portela Dos Santos et al., 2022).

Egypt's healthcare system, like many developing countries, faces challenges in delivering comprehensive post-operative care, including high patient volumes and limited resources. The absence of standardized education protocols often leaves patients underprepared for post-operative care. Addressing this gap through structured educational programs tailored to keratoplasty patients could improve outcomes (El-Sobky & Aladdin, 2024).

These programs typically cover topics such as medication adherence, wound care, and recognizing complications. For keratoplasty patients, they are essential for preventing graft rejection and infection. Moreover, these programs address emotional and psychological recovery aspects, reducing anxiety and improving adherence. Culturally tailored programs, particularly in Egypt, can also enhance effectiveness by incorporating family involvement, a common cultural practice (Ahmed & Hassan, 2020).

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).

The success of educational interventions also depends on healthcare providers' ability to deliver them effectively, necessitating interdisciplinary collaboration and standardized protocols. Despite their potential, further research is needed to evaluate the effectiveness of these programs, particularly in keratoplasty, where evidence is limited (Angelo et al., 2024).

In conclusion, structured educational programs are critical to improving post-operative outcomes in keratoplasty. In resource-limited settings like Egypt, they offer a cost-effective solution to challenges in post-operative care. Finding the best teaching strategies and evaluating their effects on patient outcomes require more investigation.

Significance of the study:

The United States and Sri Lanka, the only countries where exporting corneas is an objective in itself, account for 94% of all exported corneas worldwide. In Egypt, most corneal transplants are done with corneas imported from the United States (Wong et al,

2017). At Mansoura Ophthalmic Center, Mansoura University, Around 200 corneal transplants were performed from September 2017 to September 2021 (Mansoura Ophthalmic Center Records, 2021).

As we consider every cornea is a precious one so, it is important to design and implement an educational program for patients undergoing keratoplasty and evaluate its impact post-operative health outcomes for patients and these are our aims of this study.

Aim of the study:

The aim of this trial was evaluating the impact of educational program on post-operative health outcomes for patients undergoing **keratoplasty.**

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.

Research hypotheses:

Patients who adhered to the educational programs will achieve better post-operative health results and outcomes, represented by increased knowledge, and level of practice, as well as reduced complications post-operatively.

Methods

Research Design:

For this study, a quasi-experimental research approach (Pre & post educational Program) was used. This design was nominated to evaluate the educational intervention's effectiveness without randomly assigning participants, enabling the evaluation of practical implications in a clinical context.

Research Setting:

The study trial was implemented in the Ophthalmology department and related outpatient clinics at Mansoura University's Ophthalmology Center. This location presented a controlled setting for tracking patients' post-operative restoration and evaluating how the educational program affected their results and outcomes.

Subjects:

A selective purposive sample of forty adult patients receiving corneal transplant surgery participated in the study. Using power analysis, the sample size was established with a 95% confidence level, a significance level of $p < 0.05$, and a precision level of 5% (Thompson et al., 1992). This calculation defines a sufficient sample size to identify remarkable variations in results resulting from the educational intervention.

Inclusion Criteria:

Adult patients of either gender who were aged between twenty to sixty were eligible to participate in the trial.

Exclusion Criteria:

Patients who were unable to take part were excluded since understanding and interacting with the material presented was necessary for optimal participation in the educational program.

Tools of Data Collection:

Tool I: Patients Interview Questionnaire:

The researchers accompanied a thorough literature analysis before constructing the Patients Interview Questionnaire Sheet. Two sections were involved; Section I: Patient Demographic parameters (Patients' code number, age, gender, marital status, educational background and occupation) are among the specific personal data gathered in this section. Additionally, it collects details about their medical history, including the diagnosis, keratoplasty indication, kind of operation, evaluation of chronic conditions, and pertinent family medical history. This thorough data helps put the patient population's post-operative results in context and provides a baseline understanding of them.

Section Two: Keratoplasty Knowledge Questionnaire for Patients; Based on an analysis of both domestic and foreign literature, this section assesses patients' understanding of keratoplasty. Twenty questions cover a range of topics related to the surgery, including its definition, indications, stages involved in the procedure, possible complications after the procedure, and important instructions for preoperative and after care. The purpose of this tool is to assess the level of patient comprehension and readiness for post-operative care management.

Tool II: Patient's Health Outcomes: This tool, which has two sections, was used to gauge patient outcomes after the instructional course was put into place. The researchers divided them into Part I: Post-Operative Keratoplasty complications or Problems, which consists of seven questions designed to identify and evaluate frequent post-operative difficulties that patients may encounter. By gathering information on problems like infection, graft rejection, and other consequences, these questions seek to shed light on how successful the educational intervention was. Part II: Self-Care Practices Questionnaire: This section assesses how well patients adhere to self-care routines after surgery, breaking into the following topics in detail: Ten steps are listed for administering eye drops to guarantee proper administration. Nine stages are offered for the proper administration of eye ointments. Essential care treatments are covered in 7 phases for postoperative eye care.

Validity and Reliability:

For valid and reliable data collection, the validity and reliability of the instruments were thoroughly evaluated. Through a thorough analysis of the body of research and expert consultations, construct validity was established, guaranteeing that the instruments accurately measure the constructs they are designed to evaluate. A limited sample of patients

participated in pilot research to evaluate the tools' use, relevance, and clarity. The items and organization of the questionnaire were improved as a result of feedback from the pilot study. Cronbach's alpha coefficient was used to determine internal consistency for reliability. With a Cronbach's alpha of 0.85 for the Patients Interview Questionnaire Sheet and 0.80 for the Patient's Health Outcomes Sheet, the results showed great reliability and showed that the instruments deliver consistent and trustworthy data from various respondents.

Educational Program; (Program Duration: 6 Weeks; Total Time: 12 Hours (split into 6 sessions, lasting for 2-hours)

1. Assessment (Duration: one Week):

Prior to the start of the educational program, patients' baseline knowledge and self-care practices are thoroughly evaluated as part of the assessment phase. Patients fill out an initial assessment form during this week, which includes questions about their knowledge of keratoplasty, post-operative care awareness, and potential problems. Furthermore, a brief interview with each patient aids in locating particular areas in which they are unsure to identify the points need to verify or require further assistance. To ensure that the program meet the needs of every study participant and to customize the instructional content to cover the most relevant themes, this baseline data is essential.

2. Planning: (Duration: one Week)

Based on the assessment data, a structured educational program that is customized to the needs of keratoplasty patients is designed by researchers during this phase. This stage consists of: Designing Educational Materials: Making sure the materials are understandable in Arabic language and easily available while producing comprehensive content on keratoplasty introduction, post-operative care, and potential complications that may occur. Setting up six (two-hour) sessions that focus on various sides of post-operative care. Incorporating Interactive Elements: Developing interactive elements to improve comprehension and involvement, such as handouts, visual aids, and demonstrations. Training Instructors: to ensure consistency and efficacy in program delivery, instructors are prepared for the content and teaching techniques.

3. Implementation (Duration: six Weeks):

During the six-week implementation phase of the instructional program, patients will receive a series of two-hour focused sessions. During the first week session, brief introduction about Keratoplasty, is planned. It offers a thorough rundown of keratoplasty, including both the surgical procedure and its indications. A presentation, (a question& answer) period to answer patient concerns, and the instructional booklets distribution to emphasize the information provided are all included in this session. The Post-Operative Care Essentials course in the second week covers comprehensive guidelines for basic post-operative care

practices, for instance how to apply eye drops and ointments and maintain good hygiene. These methods are demonstrated, and patients practice their abilities through redemonstration of a role-playing activity. Step-by-step instructions are given to patients helping them in applying the learned skills efficiently.

Graft rejection and infections as potential complications are covered in the third week's sessions on how to identify and manage complications. In order to learn how to identify symptoms and respond correctly, patients take part in pleasing discussions and case studies. Emergency contact information is provided in order to ensure that patients may get the help they need at any time.

During the fourth week of pre-operative and intraoperative preparations, patients are directed and guided through the necessary surgical preparations. Preoperative instructions, procedural expectations, and checklist assembling are covered in this fourth session. Pre-surgery planning is discussed, and visual aids are used for better patients' preparations.

Post-Discharge Instructions and Self-Care, which cover the care required after discharge, including lifestyle modifications and follow-up instructions, is the focus of the fifth week. Patients form personalized treatment plans, participate in interactive (question& answer) sessions to get any questions answered, and get written instructions to help them remember the recommendations.

The sixth week's review and reinforcements session completed with a thorough recap of the main ideas discussed in earlier sessions. This session consists of knowledge assessment tests, group discussions to answer any unanswered questions, and feedback data gathering to gauge the program's success and locate areas in need of progress.

Additionally, in order to assure an adequate understanding of keratoplasty care information and to improve patient preparedness and confidence in managing their post-operative health concerns, each session is carefully planned to build upon the one before it.

4. Evaluation (Duration: four Weeks):

The educational program's evaluation phase includes a number of vital procedures to gauge its efficacy. Feedback questionnaires were filled out by patients at the close of each session to give early indicators of their comprehension and satisfaction level. In association to baseline data, a post-educational questionnaire assesses improvements in self-care behaviors and knowledge. Clinical outcomes, including post-operative problems and treatment adherence, are also assessed. After feedback examining and evaluation data, the program's overall efficacy is assessed.

Ethical considerations

The study, which was implemented at Mansoura University's Faculty of Nursing strictly complied with ethical rules (Ref. No. P. 0583), which included lessening participant risk,

obtaining informed consent, and preserving anonymity. The goal, methods, and possible risks that of the study were totally explained to the participants, and signed agreement was attained pre taking apart of the study. Confidentiality was ensured through the study. Furthermore, the study was planned to reduce any possible distress or hurt, and the educational program and qualified personnel were responsible for assessments. These precautions guaranteed that the research complied with ethical rules and respected each participant's well-being.

Statistical analysis:

SPSS version 26 was utilized for the analysis of the data. descriptive statistics, such as means and standard deviations for continuous data and frequencies and percentages for categorical variables. Fisher's exact test was used to evaluate the significance of changes in categorical outcomes for the comparison of self-care practices and knowledge levels before and after the intervention. The categorical structure of the data and the small sample sizes made this test appropriate.
Fisher's exact test was also utilized to compare the frequency of different issues between the pre-intervention and post-intervention periods in order to assess post-operative complications. Fisher's exact tests or Chi-square testing for independence were used, as applicable, to evaluate the relationship between demographic traits and knowledge or observational checklist results.

Results:

Table (1): Demographic characteristics of the study sample. The age distribution shows that 22.5% of participants are younger than 40 years, 45.0% are between 40 and 50 years, and 32.5% are older than 50 years, with a mean age of 46.6 years (±7.4). Gender distribution is nearly even, with 47.5% male and 52.5% female participants. In terms of education, 12.5% are illiterate, 25.0% can read and write, 40.0% have secondary school education, and 22.5% have a university degree. Regarding occupational status, 42.5% are not working while 57.5% are employed. The majority of participants are married (80.0%), and 20.0% are either divorced or widowed. Lastly, 25.0% of the samples are smokers, whereas 75.0% do not smoke.

Table (2): Comparison of the Keratoplasty Patient's Knowledge Questionnaire levels between pre-intervention and post-intervention. Before the intervention, 52.5% of patients had poor knowledge. After the intervention, these numbers shifted significantly: 10.0% of patients had poor knowledge, and 72.5% had good knowledge. The Fisher's exact test yielded a chi-square value (X2) of 33.408 and a p-value of less than 0.001, indicating a statistically significant improvement in patient knowledge post-intervention.

Table (3): compares the Patient's observational checklist domains and total level between pre-intervention and post-intervention. For administering eye drops, pre-intervention unsatisfactory assessments were 82.5%, which

decreased to 25.0% post-intervention (P < 0.001). For administering eye ointments, the unsatisfactory assessments dropped from 72.5% to 17.5% (P < 0.001). Regarding postoperative eye care, unsatisfactory assessments went from 75.0% to 12.5% (P < 0.001). In activities of daily living, unsatisfactory assessments decreased from 72.5% to 22.5% (P < 0.001). Overall, the patient's observational checklist showed that unsatisfactory assessments decreased from 75.0% to 20.0%, while satisfactory assessments increased from 25.0% to 80.0% (P < 0.001). These results indicate significant improvements in all domains of post-intervention.

Table (4): compares the complications experienced by patients pre- and post-intervention which indicates lower incidence of post-operative complications in all items with highly statistical significance relation (P < 0.001) in terms of suture-related complications (symptoms of foreign body sensation and pain) and statistically significant (P = 0.003) in Photophobia.

For intraocular pressure-related complications, corneal edema decreased from 10.0% to 0.0%, which was significant (P = 0.040), and redness related to infections decreased from 17.5% to 0.0%, showing a significant reduction (P = 0.006).

Table (5): explores the relationship between demographic characteristics and both the Keratoplasty Patient's Knowledge Questionnaire and the Patient's observational checklist. For the Keratoplasty Patient's Knowledge Questionnaire, Education level showed a significant association with knowledge showing the highest proportion of good knowledge (P < 0.001**). In terms of the Patient's observational checklist, no significant associations were found except for education level significantly impacted assessment outcomes (P = 0.038*). Overall, education and occupational status were key factors associated with better knowledge and assessment performance.

Figure (1): The scatter plot displays a positive correlation between two variables, as indicated by the correlation coefficient r = 0.567, with a p-value less than 0.001, signifying that the correlation is statistically significant. The red line represents the line of best fit, showing an upward trend, meaning that as the values on the x-axis increase, the values on the y-axis also tend to increase. The data points appear to be somewhat dispersed around the line, indicating a moderate correlation. Overall, the significant p-value suggests that the relationship between the variables is not due to chance.

Table 1. Distribution of the demographic characteristics of the study sample (n=40)

	N	%
Age (years)		
< 40	9	22.5
40 – < 50	18	45.0
from 50 - 60	13	32.5
Mean ±SD	46.6 ±7.4	
Gender		
Male	19	47.5
Female	21	52.5
Education		
Illiterate	5	12.5
Read/write	10	25.0
Secondary school	16	40.0
University	9	22.5
Occupational status		
Not working	17	42.5
Working	23	57.5
Marital status		
Married	32	80.0
Divorced / Widow	8	20.0
Smoking status		
Smoking	10	25.0
Not smoking	30	75.0

Table 2. Comparison of the Keratoplasty Patient's Knowledge Questionnaire level between pre – intervention and post – intervention

	Pre		Post		Fisher's exact test	
	N	%	n	%	X^2	P
Keratoplasty Patient's Knowledge Questionnaire						
Poor knowledge	21	52.5	4	10.0		
Moderate knowledge	15	37.5	7	17.5		
Good knowledge	4	10.0	29	72.5	33.408	<0.001**

Fisher's exact test ** Highly statistically significant at $p \leq 0.001$

Table 3. Comparison of the Patient's observational checklist domains and total level between pre – intervention and post – intervention

	Pre		Post		Fisher's exact test	
	n	%	n	%	X^2	P
Administering eye drops						
Unsatisfactory Assessment	33	82.5	10	25.0		
Satisfactory Assessment	7	17.5	30	75.0	26.600	<0.001**
Administering eye ointments						
Unsatisfactory Assessment	29	72.5	7	17.5		
Satisfactory Assessment	11	27.5	33	82.5	24.444	<0.001**
Postoperative eye care						
Unsatisfactory Assessment	30	75.0	5	12.5		
Satisfactory Assessment	10	25.0	35	87.5	31.746	<0.001**
Activities of daily living						
Unsatisfactory Assessment	29	72.5	9	22.5		
Satisfactory Assessment	11	27.5	31	77.5	20.050	<0.001**
Patient's observational checklist						
Unsatisfactory Assessment	30	75.0	8	20.0		
Satisfactory Assessment	10	25.0	32	80.0	24.260	<0.001**

Fisher's exact test ** Highly statistically significant at $p \leq 0.001$

Table 4. Comparison of the Patient's complications between pre – intervention and post – intervention

	Pre		Post		Fisher's exact test	
	n	%	n	%	X^2	P
Complications related to wound closure						
Wound leaks	5	12.5	2	5.0	1.409	0.235
Iris prolapses	4	10.0	2	5.0	0.721	0.396
Suture-related complications						
Symptoms of foreign body sensation	40	100.0	24	60.0	20.000	<0.001**
Photophobia	8	20.0	0	0.0	8.889	0.003*
Pain	36	90.0	10	25.0	34.578	<0.001**
Red eye	33	82.5	29	72.5	1.147	0.284
Intraocular pressure-related complications						
Corneal edema	4	10.0	0	0.0	4.211	0.040*
Intraocular inflammation	3	7.5	0	0.0	3.117	0.077
Complications related to infections						
Infectious keratitis	3	7.5	0	0.0	3.117	0.077
Rapid onset of ocular pain	3	7.5	0	0.0	3.117	0.077
Redness	7	17.5	0	0.0	7.671	0.006*
Choroidal detachment and hemorrhage- related complications						
Redness	1	2.5	0	0.0	1.013	0.314

Fisher's exact test * statistically significant at $p \leq 0.05$ ** Highly statistically significant at $p \leq 0.001$

Table 5. Association between socio demographic characteristics with Keratoplasty Patient's Knowledge Questionnaire and Patient's observational checklist

	Keratoplasty Patient's Knowledge Questionnaire								Patient's observational checklist					
	Poor Knowledge		Moderate Knowledge		Good Knowledge		Chi – Square / Fisher's exact test		Unsatisfactory Assessment		Satisfactory Assessment		Chi – Square / Fisher's exact test	
	n	%	n	%	n	%	X^2	P	n	%	n	%	X^2	P
Age (years)														
< 40	0	0.0	2	28.6	7	24.1			1	12.5	8	25.0		
40 – 50	2	50.0	2	28.6	14	48.3			5	62.5	13	40.6		
> 50	2	50.0	3	42.9	8	27.6	2.384	0.666	2	25.0	11	34.4	1.298	0.523
Gender														
Male	2	50.0	3	42.9	14	48.3			4	50.0	15	46.9		
Female	2	50.0	4	57.1	15	51.7	0.078	0.962	4	50.0	17	53.1	0.025	0.874
Education														
Illiterate	3	75.0	2	28.6	0	0.0			5	62.5	0	0.0		
Read/write	1	25.0	5	71.4	4	13.8			3	37.5	7	21.9		
Secondary school	0	0.0	0	0.0	16	55.2			0	0.0	16	50.0		
University	0	0.0	0	0.0	9	31.0	34.547	<0.001**	0	0.0	9	28.1	26.875	<0.001**
Occupational status														
Not working	2	50.0	4	57.1	11	37.9			6	75.0	11	34.4		
Working	2	50.0	3	42.9	18	62.1	0.954	0.621	2	25.0	21	65.6	4.322	0.038*
Marital status														
Married	3	75.0	6	85.7	23	79.3			8	100.0	24	75.0		
Divorced / Widow	1	25.0	1	14.3	6	20.7	0.214	0.899	0	0.0	8	25.0	2.500	0.114
Smoking status														
Smoking	1	25.0	3	42.9	6	20.7			3	37.5	7	21.9		
Not smoking	3	75.0	4	57.1	23	79.3	1.478	0.478	5	62.5	25	78.1	0.833	0.361

Chi – Square / Fisher's exact test * statistically significant at $p \leq 0.05$ ** Highly statistically significant at $p \leq 0.001$

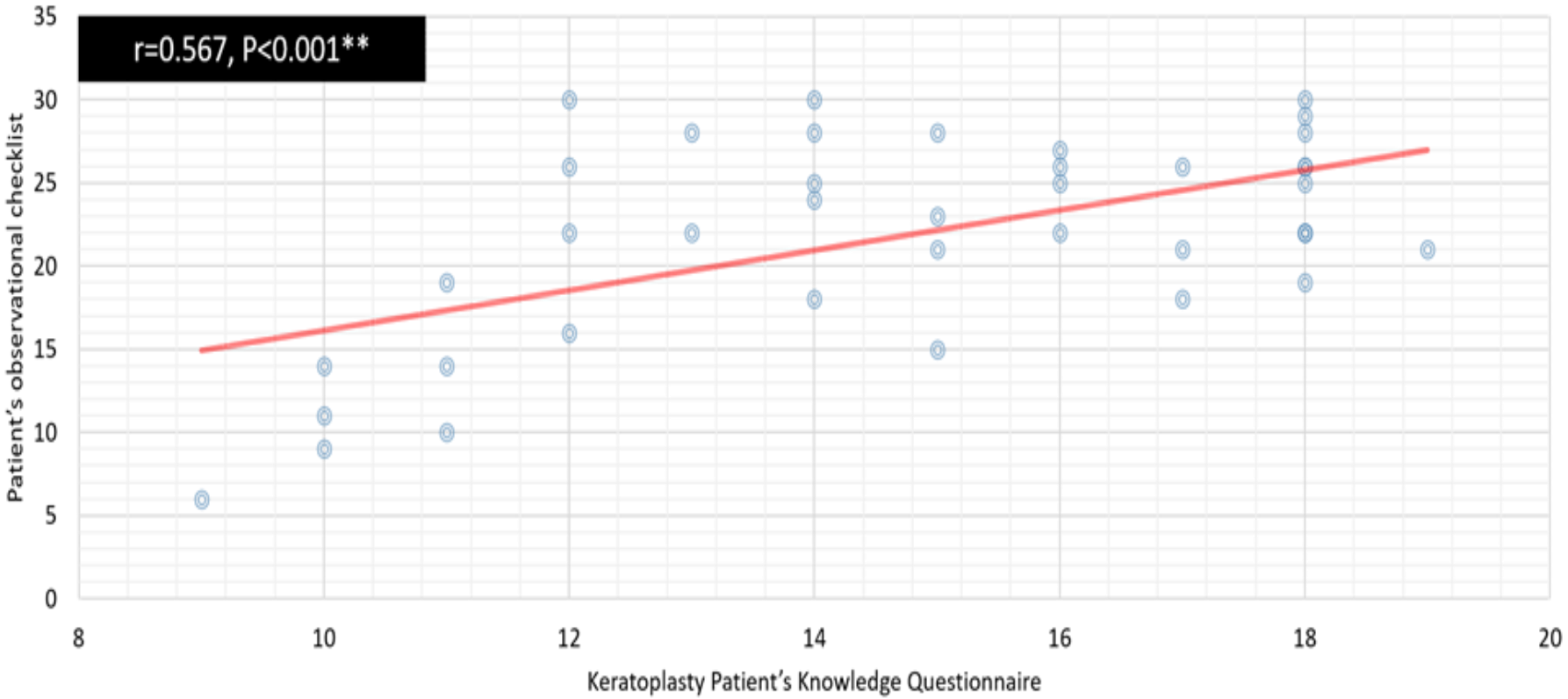

Figure 1. Correlation between Keratoplasty Patient's Knowledge Questionnaire and Patient's observational checklist

Discussion:

Keratoplasty is still the most effective treatment for corneal disorders and blindness. It is regarded as one of the most frequently transplanted tissues worldwide and is mostly used for visual rehabilitation. The primary objective of corneal transplantation is to restore vision. The indication for surgery, pain management, and preservation of the eye's structural integrity are the major factors that determine the success of an operation (Cincinnati Eye Institute, 2021). Since a successful corneal transplant enhances a patient's lifestyle and general health, their subjective experiences are a major consideration in their evaluation (Cruz et al., 2019).

Demographic characteristics of the study reveal important trends. The majority of participants are middle-aged or older, with an even distribution between males and females. Educational levels vary significantly, with a notable portion having at least a secondary school education, highlighting the potential influence of education on health literacy. Employment status shows that more than half of the participants are working, and most are married. These socio-demographic factors align with prior research, suggesting that higher education and employment are associated with better health literacy and patient outcomes (Ramadan et al., 2021).

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.

In relation to patient's knowledge assessment before and after the educational intervention show a significant improvement in the studied patients' knowledge, as nearly all patients moved from poor or moderate levels of understanding to a good level post-intervention. A notable improvement after the program's implementation could be the result of a number of factors, including improved patient communication and providing patients with coloured booklets that help them remember how to take care of their eyes, change their eye dressings, and administer eye medication. Additionally, explaining to each patient how to apply eye drops and perform eye care is helpful in this regard. It also underlined how crucial it is to reinforce the patient's understanding. These findings were consistent with those of Ahmed and Hassan (2020), who reported a statistically significant improvement in topic knowledge following the tailored health instruction, as evidenced by the substantial difference between the mean pre-test and post-test knowledge.

The significance of preoperative knowledge and postoperative nursing care, which includes awareness of signs and symptoms of potential problems, cannot be overlooked in this regard, according to Fasolo et al. (2012). Additionally, Rossable et al. (2011) reported this conclusion and stated that patient education is crucial because patients have a right to know about their diagnosis, prognosis, available treatments, and the risks involved with those treatments.

The observational checklist assessing skills in administering eye drops, eye ointments,

postoperative care, and daily living activities reflects a substantial enhancement in patient competency following the intervention. This suggests that structured educational programs using different teaching strategies such as lecture, discussion, and colored booklet can effectively enhance both knowledge and practical skills in patients, supporting their ability to manage their post-surgical.

These findings are supported by (Anitha et al., 2022; Ahmed & Hassan, 2020) 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.

Early complications include wound leakage, endophthalmitis, microbial keratitis, filamentary keratopathy, elevated intraocular pressure, wound leakage, persistent epithelial defect, and suture issues. Late complications include glaucoma, refractive error, graft rejection, and epithelial downgrowth, according to Stephen (2018). Additionally, (Dodia et al., 2014) shown that the most frequent consequences were secondary glaucoma, graft rejection, primarily endothelial type late graft rejection, and a persistent epithelial defect. In this regard, Sharma et al. (2014) discovered that after penetrating keratoplasty (PK), glaucoma and increased intraocular pressure are the second most prevalent cause of graft failure after rejection and one of the most frequent causes of irreversible sight loss.

In the light of this, the result of the present study clarified that there was a significant reduction in key post-operative complications, particularly in symptoms like pain, photophobia, and foreign body sensation, further demonstrating the effectiveness of the educational intervention. These outcomes support prior research indicating that patient education plays a crucial role in reducing post-operative complications and improving overall recovery. 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.

The analysis of demographic characteristics in relation to knowledge and skill assessments underscores there was highly significant difference between education levels in relation to knowledge and skill assessments underscores. Also, there was significant difference between occupational status in relation to skill assessments underscores. The importance of education and occupational status as key determinants of patient outcomes, with better-educated and working patients showing higher levels of knowledge and better post-operative care performance.

Also, the present study showed that there was positive correlation observed in the scatter plot, with a significant moderate correlation between two key variables, reinforces the idea that certain socio-demographic or clinical factors are closely

linked to better patient outcomes post-intervention. The statistically significant correlation suggests that as one factor improves, so does the other, highlighting the importance of targeted interventions in patient care. These findings are consistent with the literature on patient education and outcomes, suggesting that continuous education and skill enhancement programs could lead to long-term improvements in patient care and quality of life. This agrees with (Ramadan et al., 2021; Abdelmowla et al, 2017) who founded a positive correlation between patients' total knowledge and practice.

Finally, education is an easy approach for members of a multidisciplinary team to give patients the information they require, raise their level of awareness regarding their diseases, improve their problem-solving skills, and raise their level of satisfaction with the treatment they get.

Conclusion

Significant improvements in postoperative outcomes were attained by keratoplasty patients by increasing knowledge and improving practices when an educational program was implemented, proving the effectiveness of concentrated patient education in sponsoring recovery.

Complications decreased significantly because of the program's notable growth in patient knowledge and practical skills. These conclusions put forward that organized educational sessions might be very helpful in augmenting patients' compliance with postoperative care guidelines and professionally treating their problems.

Recommendation

- It is instructed that medical professionals including nurses provide educational materials in the postoperative care plan for patients who have had keratoplasty or corneal transplantation as this will give the promising results of this study. Such educational programs should be shaped to cover important sides of postoperative care, such as administration of medications, managing symptoms, and routine daily activities.
- In order to continuously enhance patient outcomes, healthcare institutions should also think about making the integration of these educational components routine procedures, which will ultimately result in improved health and fewer complications.
- Future research must attempt to include longer follow-up periods, more larger and diverse samples for determining the long-term efficacy and stability of the program's benefits and its ability to affect patient care behaviors in a wider context, as is difficult in the absence of these longitudinal data.

Study Limitation

Firstly, the study is limited due to the small sample size, which would conflict how broadly the results can be applied effectively as a bigger sample size would harvest more reliability of the results.

Besides, long-term follow-up evaluations were not included in the study, which are essential for determining the educational intervention's long-term effects on patients' outcomes.

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