

EVALUATION OF CLINICAL INDICATIONS OF PENETRATING KERATOPLASTY IN TERTIARY CARE HOSPITAL

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**Abstract:** *This study aimed to evaluate the reasons for performing penetrating keratoplasty at Nishtar Hospital Multan. The research was conducted by Nishtar Medical University and Hospital in Multan, Pakistan, from December 15, 2022, to June 15, 2023. The study included one hundred patients who presented to the OPD with indications of penetrating keratoplasty. Data was analyzed using SPSS V26 software. The study found that the most common provisional diagnosis among the participants was keratoconus, affecting 25% of them. Keratoconus is a degenerative eye disease that weakens and swells the cornea into a cone shape impairs vision. Post-infective keratitis-induced corneal scar was the second most common indication for penetrating keratoplasty. In conclusion, the study reports on the indications of penetrating keratoplasty at Nishtar Hospital Multan. It found that keratoconus followed by corneal scar (post-infective keratitis) were the leading reasons for performing penetrating keratoplasty.*

**Keywords:** Penetrating Keratoplasty, Multan, Nishtar Hospital, South Punjab

## Introduction

The surgical technique known as penetrating keratoplasty (P.K.) involves completely replacing a diseased or damaged cornea with a healthy donor cornea. The central portion of the patient's cornea is excised and substituted with a donor corneal graft of comparable dimensions, subsequently secured with sutures. Since Zirm reported the first successful keratoplasty in the human eye in 1905, corneal transplantation, known as keratoplasty, has become famous as the most common transplantation (Zirm, 1906). The first successful keratoplasty was performed on a human by Zirm. Penetrating keratoplasty (P.K.), often known as full-thickness corneal replacement, has been the standard method of corneal transplantation for more than half a century (Nishimura et al., 1999; Tan et al., 2012). On the other hand, endothelial immunological allograft rejection and the constant loss of endothelial cells from donor corneas were the primary reasons why multiple studies found that long-term corneal transplant survival rates after P.K. were poor (Nishimura et al., 1999; Thompson Jr et al., 2003). Endothelial immunological allograft rejection occurs when the recipient's immune system rejects the endothelial graft. This helps to explain why the deep anterior lamellar keratoplasty (DALK) procedure has been more popular in recent years (Wylęgała et al., 2004). In cases of keratopathy in which the endothelium has not been changed, ALK may be able to protect the healthy endothelium and prevent endothelial rejection (Reinhart et al., 2011).

The indications of P.K. differ from one geographical location to another, as do the social and economic development levels in that region. After cataract surgery was performed in the United States and Europe, keratoconus and Bullous keratopathy were shown to be the most prevalent causes of post-operative P.K. At the same time,

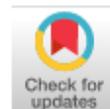
ulcerative keratitis was found to be the most common reason for post-operative ALK (Dasar et al., 2013; Jankowska-Szmul et al., 2016; Kim et al., 2017; Park et al., 2015; Xie et al., 2009). Corneal scarring and suppurative keratitis were the most prevalent indications for ALK (Al-Thawabi et al., 2017; Rangel et al., 2021). On the other hand, corneal burns and suppurative keratitis were the most common indications for P.K. (Albuainain et al., 2023; Almudhaiyan et al., 2022; Gupta et al., 2001; Rangel et al., 2021). This study evaluates the indications for penetrating keratoplasty at Nishtar Hospital Multan. We examined the indications from December 15, 2022, to June 15, 2023.

## Methodology

The Nishtar Medical University and Hospital in Multan, Pakistan, conducted this research from December 15, 2022, to June 15, 2023. The Institutional Review Board granted its clearance in terms of ethics. One hundred patients with indications of penetrating keratoplasty were included in the study. A questionnaire included inquiries on patients' demographics, age, visual acuity, and provisional diagnosis. One hundred samples were collected with patients of either gender between age 5-70 years having vision impairment due to corneal disorders, including keratoconus, congenital opacities, corneal dystrophies, corneal scarring, or corneal ulcers. It also includes patients with graft failure. The sampling technique is non-probability consecutive sampling, which involves selecting participants sequentially without randomization.

The exclusion criteria encompass retinal disorders, perceptual impairments, faulty light perception and projection, active infection, corneal vascularization, and ocular surface disease. The patients who did not give

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informed consent for the surgical procedure and occurrence of corneal disease and progressive glaucoma, pemphigoid conjunctivitis, and herpes simplex virus (HSV) keratitis were also excluded.

All patients underwent a slit lamp biomicroscopy evaluation by Consultant Ophthalmologist, and visual acuity and intraocular pressure (IOP) were recorded. Based on this assessment, a clinical diagnosis was established. Patients diagnosed with keratoconus typically undergo corneal topography assessments to evaluate the shape and curvature of the cornea. Additionally, all patients, regardless of their specific condition, underwent B-scans to exclude the presence of any fundus-related illnesses.

A questionnaire was devised that compromised questions about demographic findings, visual acuity, IOP, previous ocular surgery, indications, and duration of symptoms. SPSS 26 was used for data analysis. Means and standard deviation were calculated for different variables. Chi-square was used for comparing percentages and to find the p-value. Then, tables and graphs were made using Microsoft Excel.

**Results**

The data analysis using SPSS showed that the participants were almost equally split by gender, with 54% of men and 46% of women. This balance is important for maintaining gender diversity in the research sample and may affect the generalizability of the results. Participants' visual acuity varied, with "C.F." (Counting Fingers) visual acuity being present in 25% of the subjects. Other categories like "Plpr+" and "C.F. both eyes" were also highly represented.

**Table 1: Descriptive Statistics**

	Gender (Male/Female)	Age	Provisional Diagnosis	Previous Ocular Surgery (Yes/No)
<b>N</b>	100	100	100	100
<b>Mean</b>	1.46	36.40	4.88	1.79
<b>Std. Error of Mean</b>	.050	2.327	.280	0.041
<b>Std. Deviation</b>	.501	23.267	2.797	0.409
<b>Skewness</b>	.163	.393	0.598	-1.446
<b>Std. Error of Skewness</b>	.241	.241	0.241	0.241
<b>Kurtosis</b>	-2.014	-1.299	-.773	0.092
<b>Std. Error of Kurtosis</b>	.478	.478	.478	0.478

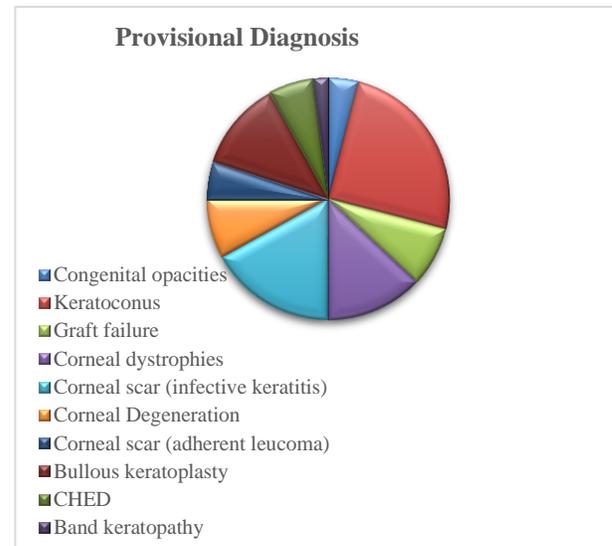
The participants' average age is 36.40 years, and their standard error of the mean (SEM) is 2.327 years. The degree of age variation within the sample is shown by the standard deviation (S.D.), which is 23.267. The distribution of ages may be favorably skewed, according to the skewness value of 0.393, which shows a slight rightward skew. This skewness is moderate, however. The age distribution is relatively platykurtic, with narrower tails than a normal distribution, according to the kurtosis value of -1.299. Most participants (79%) said they had previously had ocular surgery, while 21% said not. The data in this study exhibit a negative skew, as indicated by the skewness score of -

1.446, which suggests that more individuals had undergone prior ocular surgery.

**Table 2: Provisional Diagnosis**

Diagnosis	Frequency	Percent
Congenital opacities	4	4.0
Keratoconus	25	25.0
Graft failure	8	8.0
Corneal dystrophies	13	13.0
Corneal scar (infective keratitis)	17	17.0
Corneal Degeneration	8	8.0
Corneal scar (adherent leucoma)	5	5.0
Bullous keratoplasty	12	12.0
CHED	6	6.0
Band keratopathy	2	2.0
<b>Total</b>	<b>100</b>	<b>100.0</b>

The distribution of preliminary diagnoses among the study participants is shown in Table 2 (Figure 1). Provisional diagnoses are crucial clinical markers that aid in classifying and dividing the many eye illnesses and disorders the study participants have.



The prognosis for 4% of the patients was congenital opacities. These are congenital disabilities in the form of cloudiness or ocular abnormalities. Keratoconus is the

study's most prevalent provisional diagnosis, affecting 25% of participants. A degenerative eye ailment called keratoconus causes the cornea to weaken and swell into a cone, impairing vision. The prognosis for 8% of the individuals was graft failure. Graft failure often happens during corneal transplant surgeries. 13 percent of the subjects had corneal dystrophies. These are hereditary conditions that alter the clarity and structure of the cornea. 17% of participants had corneal scars from an infection of the cornea. According to their preliminary results, another 8% of subjects were proposed with corneal deterioration.

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The steady decline in the health and functionality of the cornea is referred to as corneal degeneration. 5% of subjects had adherent leucoma corneal scars. These scars are the consequence of prior wounds or infections. Bullous keratoplasty is a surgical surgery used to treat disorders like bullous keratopathy, and it was performed on 12% of

## Discussion

The current study reports indications of penetrating keratoplasty at Nishtar Hospital Multan. Keratoconus, followed by active Corneal scar (infective keratitis), was our study's leading indication of penetrating keratoplasty. This is pursuing previous studies from developing countries (Al-Thawabi et al., 2017; Anders et al., 2021); however, this contrasts with developed countries where bullous keratopathy and Corneal opacity are the leading indications (Anitha et al., 2022). Between December 2022 and August 2023, research was undertaken in Multan, Pakistan's Nishtar Medical University and Hospital. The results of this study have significant implications for patients who need penetrating keratoplasty (P.K.). The research population's evenly split gender of 54% males and 46% women assures that the results represent both genders, which is crucial for thorough healthcare planning. Notably, the average age of 36.40 years and the slight rightward skew show that P.K. is required throughout a broad age range, highlighting the variety of age-related eye problems. Keratoconus appears as the dominating provisional diagnosis, affecting 25% of participants, highlighting the need for specialist treatment for this ailment in the area (Anshu et al., 2021). The frequency of corneal scarring from infections, which stands at 17%, highlights the necessity of public health programs emphasizing infection prevention and eye health awareness. In addition, the fact that most participants had already had eye surgery shows that this group requires ocular treatments often, necessitating individualized treatment plans (Arundhati et al., 2021; Feizi et al., 2017). The demographics and visual problems of those in Multan, Pakistan, who need P.K. are better understood due to these results, highlighting the need for age- and condition-specific treatments.

## Conclusion

Many people with blindness or visual impairment brought on by corneal disorders may have their vision restored through penetrating keratoplasty [19]. However, the prognosis of the result depends on the condition causing blindness or visual impairment. Of the numerous keratoplasty procedures, penetrating keratoplasty was the most often performed procedure in patients with visual impairment caused by full-thickness corneal pathology [20]. The only way ophthalmologists can treat corneal blindness, which has no known medical treatment, is by using dead donors' eyes. The study's implications advise ophthalmologists and other medical practitioners managing corneal disease. More individualized and efficient patient treatment is made possible by being aware of the most common indications of P.K., such as keratoconus and pseudophakic bullous

patients. CHED (Congenital Hereditary Endothelial Dystrophy) was the participant's tentative diagnosis in 6% of cases. This unusual hereditary disease impacts on the corneal endothelium. 2% of individuals had this disorder, characterized by calcium deposits in the cornea.

keratopathy.

## Declarations

### Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

### Ethics approval and consent to participate.

Approved by the department Concerned.

### Consent for publication

Approved

### Funding

Not applicable

## Conflict of interest

The authors declared an absence of conflict of interest.

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