

# A study of frequency and etiopathogenesis of corneal blindness at tertiary health care centre

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## Abstract:

Corneal blindness is a major contributor of the blindness in the community. This study was done to know the frequency and etiopathogenesis of corneal blindness in tertiary health care centre. In our study, we included 75 eyes of 63 patients out of which 33 (52.4%) were males and 30 (47.6%) females. The age group included was from 4 to 83 years with mean age group of 43.67±22.89 years, 51 patients (80.9%) had unilateral corneal involvement and 12 patients (19.04%) had bilateral corneal involvement. The commonest cause of corneal blindness noted in our study was corneal opacity in 20 eyes (26.67%) along with infective and nutritional keratitis occurring in same percentage i.e 20 eyes (26.67%). Penetrating keratoplasty and its newer modifications are the mainstay treatment options for corneal opacity but it was done only in 10 eyes (50%). The biggest hurdle for reduced transplantation is lack of availability of good quality donor's tissue along with suitable recipient. The procurement of healthy corneas is the necessity of time and so is the awareness about eye donation in the community.

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## Introduction:

World Health Organization (WHO) has stated blindness as visual acuity of a person in the better eye to be  $\leq 3/60$  or a visual field less than 10 degree(1-2). WHO has updated the definition of blindness and visual impairment in the international statistical classification of diseases (ICD-10), according to this visual acuity of less than 3/60, finger counting at 1 meter, light perception or no light perception are included(3). Corneal disorders represent second commonest cause of blindness in developing countries like India(2,4-5). Corneal diseases lead to variable grades of corneal opacity affecting its transparency and hence impair the visual acuity. There are about one million corneal blind cases in India and every year about 20,000 new cases are added to the existing list, as per the NPCB data 2012.

Major causes of corneal blindness are infective corneal ulcers, trachoma, ocular injuries, keratomalacia due to nutritional deficiency and traditional eye care practices, most of them are preventable and are treatable by proper management of the causative factor at appropriate time. Corneal scarring due to keratitis and ocular trauma are major causes of unilateral and bilateral corneal blindness in children and young adults(2). Untreated primary corneal ulceration continues to be major cause of global corneal blindness(6). Traditional eye medicines have also been implicated as one of the

risk factor in current epidemic of corneal ulceration in developing countries. Thus, corneal blindness is a major factor in the community which made us to select this topic and the objective behind this study is to identify the etiology responsible for various corneal disorders and their frequency in rural population. The hot humid climate in tropical countries like ours favors a high occurrence of infectious keratitis which in turn increases the incidence of corneal blindness. The epidemiology of corneal blindness is varied, and encompasses a wide variety of infectious and inflammatory eye diseases.

India has the world's largest corneal blind population (4), that is the prevalence of corneal blindness in Indian population is 0.45%(7). As per the 2011 census of India, there are about 1.22lac of bilaterally blind people in the country. Only 50% of the above received vision by penetrating keratoplasty. The main reason for such reduced corneal transplantation is that out of the total eyes received only 50% are utilized for optical keratoplasty. Furthermore, 20,000 new cases are being added annually constituting a large back log of corneal blindness. In this scenario it is expected that the number of corneal blind cases will increase up to 10.6 million by 2020. According to the National Programme of Control of Blindness published data, India needs approximately 1.40lac corneas as of now. For meeting the above criteria, it requires technically improvised eye bank services to increase the number of keratoplasty surgeries. The

largest barrier for corneal transplantation is the lack of availability of a good quality donor tissue (4). The procurement of healthy corneas is the necessity of time and so is the awareness about eye donation in the community.

#### **Aims and objectives:**

1. To study the etiopathogenesis, frequency and demographic profile of corneal blindness in a tertiary health care centre.
2. To create awareness for eye donation among the population.

#### **Material and Methods:**

The study was a Hospital based prospective cross-sectional study conducted on all patients coming to cornea clinic of NKPSIMS from June 2013 to August 2013. We included 75 eyes of 63 patients in our study.

#### **Inclusion criteria-**

1. Patients of all age groups and both sexes who came to the cornea clinic in the outpatient department of ophthalmology.
2. All patients with corneal diseases were included.

#### **Exclusion criteria-**

1. Patients not giving consent for inclusion in the study.
2. Blindness due to other causes like cataract and retinal disorders.
3. Patients lost during the study.

All patients who came to the ophthalmology OPD underwent a detailed slit-lamp examination, and those with corneal diseases were included in the study. Written informed consent of the patients was taken to include them in the study. The best corrected visual acuity was recorded on the Snellen's chart and detail corneal examination was done on a slit-lamp along with rest of the anterior segment. Dilated fundus examination was done. Intraocular pressure was measured by Goldman's Applanation Tonometer. Awareness was created regarding eye donation by verbally informing the importance about corneal transplantation to the patients and the accompanying relatives by Eye Bank counselor. It was also done by distributing information leaflets.

The study protocol was approved by our institutional review board and adhered to the tenets of the Declaration of Helsinki

#### **Results:**

Statistical analysis of 75 eyes in 63 patients-

Total number of patients examined were 63, out of which 33 (52.4%) was males and 30 (47.6%) females. This accounts for 4.6% higher preponderance of males over females in our study (Table 1).

All the patients were divided into nine age subgroups for easy understanding of the current age distribution among the corneal diseases. Range selected is of 10. The mean age of presentation found in our study is  $43.67 \pm 22.897$  years (Table 2). Highest frequency is in the age group comprising of people between 61-70 years of age, the number being 10(15.9%) out of 63 total patients. This is followed by lower age group of 11-20 years and 41-50 years comprising of 9(14.3%) patients in both the group individually. The age groups 21-30 years and 71-80 years are the third most prone age groups for corneal diseases, the patients number being 8(12.7%) in each group. This is followed by the age groups 31-40 years including 7(11.1%) patients, 51-60 years including 6(9.5%) patients, 0-10 years including 5(7.9%) and 81-90 years including 1(1.6%). 81-90 years being the most unaffected age group. Age distribution chart also reveals that the minimum age of suffering is four years and the maximum is 85 years in our study (Table 3).

In our study Table 4 represents the categories of visual impairment and blindness; we have included vision 6/60, 3/60, CF1mt, HM, PL/PR in severe impairment and blindness. Total 46 eyes (61.3%) out of 75 eyes were in the category I of severe impairment and blindness. Category II is moderate visual impairment, i.e. 6/36, 6/24 and 6/18. Total 23 eyes (30.7%) out of 75 eyes fall into this category. Category III included all the patients who had vision better than 6/18. Total 6 eyes (8%) out of 75 eyes fell into this category. Figure 1 represents laterality of the eye, showing that the involvement of a single eye (either left or right) is 69.86% more than that of the bilateral involvement. This accounts for 51 (80.9%) unilateral involvement and 12 (19.04%) bilateral involvement. Various etiologies of corneal blindness are shown in (Table 5), the most commonest amongst all being corneal opacity being responsible for 26.67% of blindness along with infective and nutritional keratitis sharing the same percentage (26.67%). These are followed by corneal dystrophies and Keratoconus showing that 13 (17.33%) out of 75 eyes suffered from this. Corneal degeneration was seen in 10 (13.33%) eyes. Corneal injury was found in 8 (10.67%) eyes whereas the least cause of

blindness was seen to be congenital including only 4 (5.33%) eyes.

Treatment was given according to the cause of the diseases. Infective keratitis was managed medically according to the etiology by anti-fungal, anti-viral and anti-bacterial agents. The nutritional keratopathy was managed by vitamin A supplements and topical lubricants and mild steroids were prescribed for dry eyes and corneal degenerations, corneal dystrophies. This treatment was given to 61 (81.4%) eyes out of the total 75 eyes. Penetrating keratoplasty was done on 10 (13.3%) eyes as a surgical approach. 4 (5.3%) out of 75 eyes were seen to be untreatable (Figure 2).

**Table 1: Gender Distribution**

	Frequency (No.)	Percentage (%)
Female	30	47.6
Male	33	52.4
Total	63	100

**Table 2: Mean and S.D. of Age**

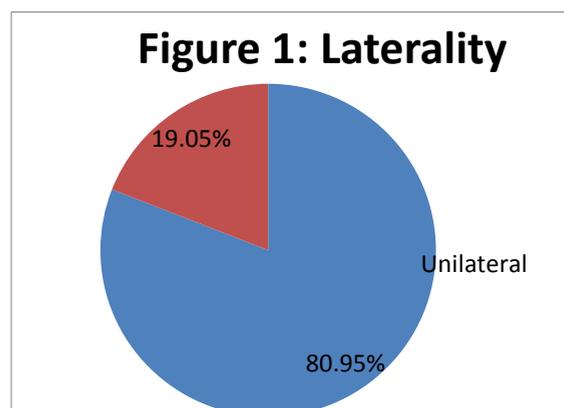
	Normal	Minimum	Maximum	Mean	Std. Deviation
AGE (years)	63	4	85	43.67	22.897

**Table 3: Distribution of Age**

Age range (yrs)	Frequency (No.)	Percentage (%)
0-10	5	7.9
11-20	9	14.3
21-30	8	12.7
31-40	7	11.1
41-50	9	14.3
51-60	6	9.5
61-70	10	15.9
71-80	8	12.7
81-90	1	1.6

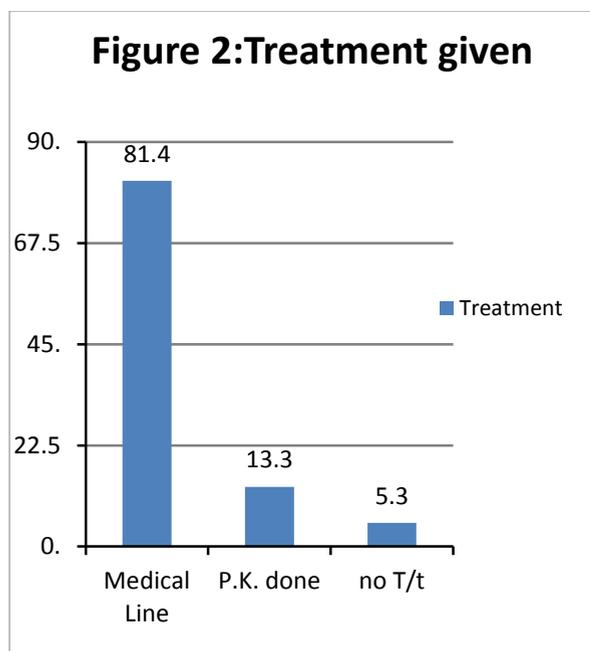
**Table 4: Categories of visual impairment and blindness**

Categories		Frequency (No.)	Percentage (%)
Severe Visual Impairment and blindness (less than 6/60)	I	46	61.3
Moderate visual impairment (6/36 to 6/18)	II	23	30.7
No visual impairment ( better than 6/18)	III	6	8.0
Total		75	100.0



**Table 5: Various corneal etiologies leading to corneal blindness**

Diagnosis	Frequency (No.)	Percentage (%)
Infective and nutritional Keratitis	20	26.67
Corneal Opacities	20	26.67
Corneal Dystrophies and Keratoconus	13	17.33
Corneal Degeneration (Bullous Keratopathy and band Keratopathy)	10	13.33
Corneal Injury	8	10.67
Congenital	4	5.33
Total	75	100



### Discussion:

Whitter J et al (2) published in 2001 the importance of corneal diseases as a major cause of blindness in the world. It still remains fourth cause of blindness after cataract. The prevalence of corneal blindness varies from region to region with highest in developing countries. Corneal scarring from trachoma, vitamin A deficiency and use of traditional eye medicines were responsible for 44% of bilateral blindness and 39% of mono ocular blindness. In our study nutritional keratopathy and infective keratitis account for 26.67% asserting the high prevalence rate of these disorders. According to the statistics of our study 12 (19.04%) out of 63 patients had bilateral involvement. Blindness due to corneal opacity post infective remains the leading cause (26.67%) whereas corneal dystrophies and corneal degenerations were noted in 17.33% and 13.33% of corneal diseases respectively.

Gupta N et al (8) in the year 2015 found that prevalence of corneal blindness in India was 0.12%. In our study from all the cases of corneal disorders presented, prevalence of corneal blindness was 0.18%.

Dandona R et al (9) in the year 2003 reported that prevalence of bilateral corneal blindness cases was 0.01% and unilateral cases were 0.56% with male preponderance. Similarly, in our study cases presented with bilateral blindness were 0.16% and unilateral cases were 0.68% with higher male ratio.

Oliva MS, Schottman T, Gulati M et al (4) stated that corneal blindness is estimated to be the second most prevalent cause of blindness in many developing countries. Globally bilateral corneal blindness is estimated to be 4.9 million (12%) persons of 39 million blind utilizing the WHO 2010 global blindness data. Trachoma, corneal opacities and onchocerciasis have decreased from 9.5% to 7% but undetermined causes have increased from 13% to 21%. The burden of corneal blindness on the community is reflected by the prevalence and the younger age of those with corneal blindness with very high disability adjusted life years (DALYs). In our study also the younger age group zero to 30 years of age constituted 35% of total corneal patients. Also undetermined cause of corneal opacity accounted for 26.67% of corneal blindness similar too above study.

Sharman S et al (5) found that ocular trauma and corneal ulcerations are significant causes of corneal blindness and may be responsible for 1.5-2 million new cases of unioocular blindness every year. Infectious conditions like corneal ulcers and non infectious conditions like corneal dystrophies and bullous keratopathy were more common causes of corneal blindness in developing countries. In children the causes of corneal blindness includes keratomalacia due to vitamin A deficiency, ophthalmia neonatorum and ocular trauma. In our study also main contributing factor for corneal disorders were infective keratitis, noninfectious cause included corneal degenerations and dystrophies. Nutritional keratopathy was commonly found in younger age groups.

Ament J et al (6) in the 2010 stated that of the 45 million blind people, corneal diseases accounted for 8 million blind out of which 1.5 million being children that is 18.75% of corneal blind were in the pediatric age group. In our study also 22.2% patients were of the age group zero-20 years suggesting comparable prevalence rate of corneal blindness in children.

Gilbert C, et al (10) stated that the major causes of blindness in children vary widely from region to region. Corneal scarring from measles, vitamin A deficiency, the use of harmful traditional eye remedies, and ophthalmia neonatorum are the major causes in low-income countries. Our study ascertains that nutritional and infective keratitis is the most important cause of preventable corneal blindness in the pediatric age group.

Infective keratitis was found to be the common cause of corneal blindness in adults. Sony P et al(11) found 28.38% cases of infective keratitis in the year 2005. In our study, we found 20% cases of infective keratitis

as a leading cause of corneal blindness in adults. Dandona R et al (9) reported it to be 17.7%.

In our study nutritional keratopathy due to vitamin A deficiency accounted for 6.66% in younger age group. In 2011 Sachdeva S et al (12) also reported the prevalence of vitamin A deficiency to be 9.1%.

Gupta N et al (7) in 2013 observed in their study "Burden of corneal blindness in India", that corneal opacities developed after various corneal disorders and were responsible for 28.1% of cases, which was comparable to our study that is 26.67%.

### Conclusion:

With the inference drawn from the study we conclude that:

Infective keratitis was the commonest etiopathogenesis and one of the leading causes of visual disability found in our study. Other major etiologies of corneal blindness were corneal dystrophies, degenerations and corneal injuries in adults. In younger age groups major causes found were nutritional keratopathy, congenital disorders and trauma.

More than half of the corneal blindness etiologies were due to avoidable and treatable causes like infective keratitis, nutritional keratopathy and trauma. In preventable blindness, vision can be conserved with proper knowledge of the disease, early diagnosis and timely management. Easy availability of eye care diagnostics and medications, even in rural areas should be one of the aims of community programmes to achieve the target of early treatment. Major cause of nutritional keratopathy is vitamin A deficiency which can be treated by supplementation of vitamins and prevented by creating awareness about diet rich in vitamin A.

Two thirds of the patients had unilateral involvement on presentation whereas rest was bilateral, with male preponderance.

The target group was from rural area with lower socio economic status and poor hygiene which is a significant health problem and needs to be given more attention.

Prevention is more cost effective in long term basis, which can be achieved by increasing awareness and various health promotion programmes. Awareness should be regarding various risk factors, such as proper eye care, avoiding eye injuries, use of protective goggles, and importance of balanced diet and avoidance of self/traditional medication. Eye

donation and its importance were also equally emphasized.

Prophylaxis and early treatment still remains the gold standard in reducing the burden of corneal blindness in developing countries like India.

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