Research Article

Assessment of Pattern Of Visual Impairment And Etiology of Corneal Disorders in Tertiary Eye Hospital: A Cross-Sectional Study

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Abstract

Background: Corneal diseases are a major cause of avoidable blindness, particularly in developing countries. Limited information is available regarding the pattern of corneal visual impairment and its etiological factors in western Nepal. This study aimed to assess the pattern of visual impairment and identify etiological factors associated with corneal disorders in this region.

Methods: A hospital-based cross-sectional study was conducted at a tertiary eye hospital. A total of 151 patients with corneal diseases were selected through simple random sampling. Demographic, clinical, and ocular history data were collected using a structured Proforma. Comprehensive eye examinations with slit-lamp biomicroscopy and visual acuity assessment were performed using a Snellen chart. Visual impairment was categorized according to World Health Organization criteria. Data were analyzed using SPSS version 20, with descriptive statistics and chi-square tests. A p-value <0.05 was considered statistically significant.

Results: Among 151 participants, 60.9% were male, with a mean age of 44.12±16.94 years. Most participants were from rural areas (86.1%) and engaged in agriculture (47.7%). Infectious etiologies accounted for 58.3% of cases, with fungal Keratitis being the most common (39.1%), followed by viral infection (29.8%). Nearly half (47.7%) reported a history of ocular trauma, predominantly from vegetable matter (43.5%). Moderate visual impairment was observed in 34.4% of patients, while blindness affected 30.5%. Rural residence (p=0.022) and central corneal opacity (p<0.001) were significantly associated with poorer visual outcomes.

Conclusions: Infectious Keratitis and trauma were the leading causes of corneal blindness. Strengthening eye safety measures and improving rural eye care services may reduce corneal visual impairment and blindness.

Keywords: corneal diseases; corneal opacity, visual impairment; blindness.

Introduction: -

Corneal visual impairment or blindness is a global challenge affecting nearly 5.5 million people bilaterally and 6.2 million unilaterally worldwide(1) . In South-East Asia, corneal diseases are the second leading cause of blindness with 2.6 million blind individuals(2) Corneal opacity was estimated to be 3.2% of all cases of blindness and 1.3% of all cases of moderate to severe visual impairment. (1, 3).In rural north India, 30-40% had blindness and another 30% had moderate visual impairment in eyes with corneal opacity(4, 5) Despite the significant burden of corneal diseases, there is limited evidence regarding the pattern of visual impairment and etiological factors associated with corneal disorders in Western Nepal. The magnitude and etiology of the problem may differ based on socio–economic status, geographical location and educational level(6)Therefore, this study aimed to assess the pattern of visual impairment and identify the etiological factors associated with corneal diseases among patients attending a tertiary eye care center in Western Nepal.

Methodology

Study Design and Sampling

A hospital-based observational cross-sectional study was conducted at Lumbini Eye Institute and Research Centre, Bhairahawa, in Western Nepal, from January 2026 to May 2026.The study included patients diagnosed with

corneal diseases or disorders who attended the corneal subspecialty department during the study period. Participants were selected using a simple random sampling technique.

Inclusion and Exclusion Criteria

Patients with corneal disorders or corneal opacity after healed Keratitis were included in the study. Patients with active corneal or conjunctival infections and other ocular comorbidities such as cataract, glaucoma, uveitis, and retinal diseases were excluded to reduce potential confounding effects on visual acuity outcomes.

Data Collection Procedure

A structured proforma was used to collect socio-demographic and clinical information. Data regarding age, sex, marital status, residence, occupation, educational status, history of ocular trauma, use of traditional medications, over-the-counter medications, use of protective eyewear, and previous ocular history were recorded through detailed patient interviews and clinical evaluation through Ophthalmic Examination

All participants underwent a comprehensive eye examination. Slit lamp biomicroscopy was performed to assess the site, size, depth, and location of corneal opacity. Visual acuity was measured using Snellen's visual acuity chart and later converted into decimal notation for statistical analysis. In patients with visual acuity worse than 6/60, finger counting, hand movement, and light perception assessments were performed where applicable.

Classification of Visual Impairment

Visual impairment was categorized according to the World Health Organization (WHO) classification:

- Mild or no visual impairment: visual acuity ≥6/18
- Moderate visual impairment: visual acuity <6/18 to 6/60
- Severe visual impairment: visual acuity <6/60 to 3/60
- Blindness: visual acuity <3/60

For bilateral cases, the visual acuity of the worse-affected eye was considered for analysis.

Quality Control

All ophthalmic instruments used during the study were regularly calibrated and standardized to minimize observer and measurement bias. Clinical examinations were performed following standardized examination procedures.

Statistical Analysis

Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics, including frequency, percentage, mean, standard deviation, and ranges were used to summarize the data. Inferential statistics were performed using the Chi-square test to determine the association between visual impairment and related variables. A p-value of less than 0.05 was considered statistically significant.

Ethical Consideration

The study was approved by the Institutional Review Committee (IRC) of Lumbini Eye Institute and Research Centre. Verbal informed consent was obtained from all participants prior to enrollment and confidentiality of patient information was maintained throughout the study.

Result: This study included 151 patients with corneal disorder. Males constituted the majority (60.9%), while females accounted for 39.1% in the study. The average age of the patients was 44.12 $\pm$ 16.94 with range of 7 -70 years. The most affected age group was 41–60 years (39.1%), followed by 20–40 years (31.1%) and least affected of age group was <20 years (9.9%).The results showed that most of the patients were married (80.8%) and resided in rural areas (86.1%). Agricultural and construction-related occupations dominated (47.7%), and a large proportion were illiterate (43.7%) or had only primary/informal education.

Table no.1: Frequency distribution of socio-demographic information of patients

Variables	Frequency(n)	Percentage (%)
Sex		

Male	92	60.9
Female	59	39.1
Age group		
<20	15	9.9
20-40	47	31.1
41-60	59	39.1
>60	30	19.9
Marital Status		
Married	122	80.8
Unmarried	29	19.2
Residence		
Rural	130	86.1
Urban	21	13.9
Occupation		
Indoor work/ Services	31	20.5
Agricultural work / Construction	72	47.7
Industrial work	11	7.3
Children and Student	13	8.6
Business	4	2.6
Others	20	13.2
Education		
Illiterate	66	43.7
Informal	19	12.6
Primary	31	20.5
Secondary	18	11.9
Higher Education	17	11.3

Table no.2: Frequency distribution of clinical parameters of patients

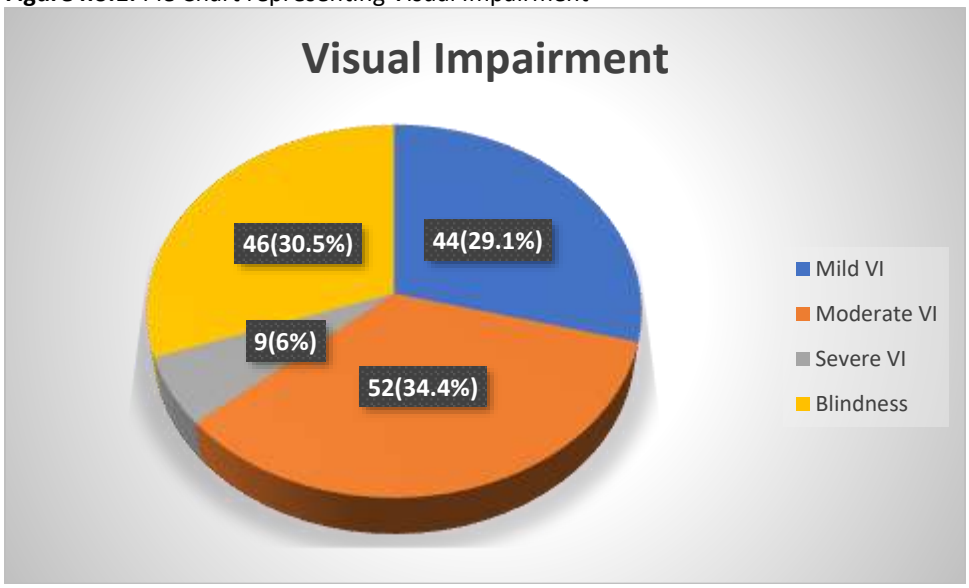
Clinical Variable	Frequency(n)	Percentage (%)
Affected Eye		
Right Eye	64	42.4
Left Eye	67	44.4
Both Eye	20	13.2
H/0 Using Eye Wears		
Yes	37	24.5
No	114	75.5
Location of C.O		
Central	59	39
Paracentral	46	30.5
Peripheral	30	19.9

H/0 Trauma		
Yes	72	47.7
No	79	52.3
Use of OTC Medicine		
Yes	87	57.6
No	64	42.4
Use of Tradition Medicine		
Yes	10	6.6
No	141	93.4
Etiology		
Infective	88	58.3
Non-Infective	41	27.2
Both	22	14.6
Infectious		
Bacterial	6	4
Viral	45	29.8
Fungal	59	39.1
Non-Infectious		
Trauma	50	33.2
Keratoconus	7	4.6
Corneal Dystrophy	1	0.7
Steven's Johnson Syndrome	1	0.7
Surgical complication	7	4.7
Others	6	4.7
Trauma		
Blunt trauma	36	23.8
Penetrating trauma	10	6.6
Chemical Burn	8	5.3
Explosive Materials (pataka, bom)	1	0.7
Gas Explosion	1	0.7
Trauma Caused by		
Vegetable matter	20	43.5
Metal steel	6	13.0
Chemical	6	13.0
Wooden Block	4	8.7
Animal matter	3	6.5
Others	3	6.5
Hand	2	4.3
Animal matter	1	2.2
Thermal/Burn	1	2.2
Associated Disease		

Diabetic	9	6
Measles	2	1.3
Non.	140	92.7

Out of 151 patients, the left eye (44.4%) and right eye (42.4%) were nearly equally affected, with 13.2% of cases involving both eyes. Eyewear was only used by 24.5% of patients. The most prevalent location of corneal opacity was central (39.0%), which was followed by paracentral (30.5%). In almost half of the cases (47.7%), a history of trauma was reported and mostly trauma was caused by vegetable matter (43.5%). The percentage of people who used over-the-counter (OTC) medications was high (57.6%),while traditional medicine use was low (6.6%).Similarly, more than half proportion about 58.3% had an infectious etiology followed by a non-infective etiology (27.2%) and both constitutes of 14.6%.In infectious etiology, fungal infections (39.1%) and viral infections (29.8%) were the most common (58.3%), and in non-infectious, 33.2% of cases had trauma, primarily blunt trauma (23.8%). Similarly, only 7.3% patients had associated diseases such as diabetics and measles.

Figure no.1: Pie Chart representing Visual Impairment



The results showed that majority of the patients had moderate visual impairment (34.4%) followed by blindness (30.5%), mild visual impairment (29.1%), and least were having severe visual impairment which is about 6%.

Table no.3: Association between Visual Impairment with socio demographic and clinical variables

Variables	Category	Visual Impairment		P value
		Moderate/ Severe	Blindness	
Gender	Male	38(60.3)	25(39.7)	0.428
	Female	23(52.3)	21(47.7)	
Age group(years)	<20	7(70)	3(30)	0.796
	20-40	19(57.6)	14(42.4)	
	41-60	25(53.2)	22(46.8)	
	>60	10(58.8)	7(41.2)	
Marital Status	Married	50(56.8)	38(43.2)	0.931
	Unmarried	11(57.9)	8(42.1)	
Residence	Rural	51(53.1)	45(46.9)	0.022

	Urban	10(90.9)	1(9.1)	
Occupation	Indoor work/ Services	14(56)	11(44)	0.957
	Agricultural work / Construction	31(58.5)	22(41.5)	
	Industrial work	3(50)	3(50)	
	Children and Student	5(55.6)	4(44.4)	
	Business	1(33.3)	2(66.7)	
	Others	7(63.6)	4(36.4)	
Education	Illiterate	24(47.1)	27(52.9)	0.398
	Informal	9(69.2)	4(30.8)	
	Primary	10(66.7)	5(33.3)	
	Secondary	9(64.3)	5(35.7)	
	Higher Education	9(64.3)	5(35.7)	
Affected Eye	Right Eye	25(58.1)	18(41.9)	0.775
	Left Eye	27(54)	23(46)	
	Both Eye	9(64.3)	5(35.7)	
H/O Using Eye Wears	Yes	18(69.2)	8(30.8)	0.148
	No	43(53.1)	38(46.9)	
Location of Corneal. Opacity	Central	29(41.4)	41(58.6)	<0.001
	Paracentral	24(85.7)	4(14.3)	
	Peripheral	7(87.5)	1(12.5)	
H/O Trauma	Yes	27(49.1)	28(50.9)	0.089
	No	34(65.4)	18(34.6)	
Use of OTC Medicine	Yes	30(50)	30(50)	0.098
	No	31(66)	16(34)	
Use of Tradition Medicine	Yes	4(44.4)	5(55.6)	0.494
	No	57(58.2)	41(41.8)	
Etiology	Infective	42(60)	28(40)	0.39
	Non-Infective	19(51.4)	18(48.6)	
Associated Disease	Diabetic	3(60)	2(40)	0.971
	Measles	1(50)	1(50)	
	Non.	57(57)	43(43)	
Trauma caused by	Animal matter	2(50)	2(50)	0.489
	Metal steel	3(50)	3(50)	
	Chemical	3(50)	3(50)	
	Hand	1(50)	1(50)	
	others	0(0)	3(100)	
	Thermal/Burn	0(0)	1(100)	
	Vegetable matter	9(45)	11(55)	
	Wooden block	3(75)	1(25)	

Bivariate analysis showed that among socio-demographic and clinical variables, only residence and location of corneal opacity were significantly associated with visual impairment. Rural residents had a significantly higher proportion of moderate/severe visual impairment or blindness (46.9%) compared to urban residents (9.1%, p=0.022).

Severe visual impairment or blindness was strongly associated with the central location of corneal opacity (58.6% blindness in central vs. 14.3% in paracentral and 12.5% in peripheral, p<0.001). Patients with central corneal opacity had markedly poorer visual outcomes.

Other socio-demographic and clinical factors did not show a statistically significant association with the level of visual impairment.

Discussion:

The present study assessed the socio-demographic characteristics, clinical profile, and visual outcomes of 151 patients attending a tertiary eye care center. This study found that the majority of the patients had moderate visual impairment followed by blindness. Place of residence (urban or rural) and the central location of corneal opacity were significantly associated with moderate to severe visual impairment or blindness.

In the present study, males constituted 60.9% of the participants and the most affected age group was (41-60), which is an economically productive age. However, males are more frequently involved in outdoor activities, such as working in agricultural fields or on construction sites. Our study also demonstrated that a large proportion of participants (86.1%) were from rural areas, involved in agriculture- or construction-related work (47.7%), and were more exposed to vegetative trauma, dust and metal particles. Additionally, the high illiteracy rate (43.7%) observed may have contributed to poor awareness of eye protection and safety measures. These findings align with studies conducted in China, Tehran and India. (4, 6, 7)

Our study revealed that infectious etiology accounted for 58.3% of cases, with fungal infection being the most common infection cause (39.1%), followed by viral infection (29.8%) and bacterial infection (4.0%). Fungal Keratitis is highly prevalent in tropical or subtropical regions, often due to ocular trauma caused by organic or plant/vegetable materials (e.g., leaves, wood, or soil).(9–11) This finding is inconsistent with previous results, in which bacterial Keratitis was 24.07%, followed by fungal Keratitis 21.29% and viral Keratitis 17.59%(12).A previous study conducted by Esraa El et al and Sarahc xu also found a high prevalence of infectious Keratitis caused by bacteria(8, 10)

In the current study, nearly half of the patients had a history of trauma (47.7%) and vegetable matter was identified as the most common traumatic agent (43.5%). Such trauma creates a favorable environment for fungal growth and leads to corneal infection(14). Trauma was also a major non-infectious cause of corneal disease, accounting for 33.2% of cases, with blunt trauma (23.8%) being the most common type, followed by surgical complication (4.7%) and keratoconus 4.6%. Similar observations have been reported in previous studies by V. Gupta et al, Padma B et al (12,15)

Regarding visual status, moderate visual impairment was the most common presentation (34.4%), followed closely by blindness (30.5%). This indicates that corneal opacity vs diseases remain significant causes of visual impairment or blindness.(16)A similar study conducted in rural north India found that 30-40% were blind and another 30% had moderate visual impairment in corneal opacity cases.(5, 11) Central corneal opacity was found to be significantly associated with severe visual impairment and blindness (p<0.001). Patients with central opacity had markedly poorer outcomes than those with paracentral or peripheral involvement, due to obstruction of the visual axis.(18) Similar associations have been documented in previous studies by Padma B et al. (2016.(15)

Residence was another factor significantly associated with visual impairment (p=0.022), with rural residents showing poorer visual outcomes than urban residents. This may be due to limited accessibility to eye care services, delayed presentation, lower awareness and socioeconomic barriers among rural populations. A study by Esraa EL et al. found that rural residence was a risk factor for severe visual impairment or blindness associated with corneal diseases.(8) Which is consistent with our finding. However, a similar study conducted in China did not show any significant association between rural living and corneal blindness.(4).

Being a hospital-based cross-sectional study, the findings may not fully represent the general population. The study also relied partly on patient-reported history, which may introduce recall bias. Future multicenter

longitudinal studies with larger sample sizes are recommended to better understand the visual outcomes and etiology of corneal diseases in Nepal.

Conclusion:

Corneal diseases predominantly affect rural male with economically productive age group involved in agricultural occupations. Infectious Keratitis, particularly fungal infection, and blunt trauma, particularly by vegetative matter, were the major etiological factors. Rural residence and Central corneal were significantly associated with moderate to severe visual impairment or blindness. The majority of patients suffered from moderate visual impairment, followed by blindness. Community awareness, occupational eye protection, early diagnosis, and improved access to rural eye care services are essential to reduce corneal blindness and visual impairment.

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Conflict of interest: None.

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