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Common Causes Of Red Eye In Patients Presenting To An Ophthalmology Department Conjunctivitis, Keratitis, Uveitis

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ABSTRACT

Background: Red eye is commonly seen in the clinic setting, with conditions ranging from the comparatively harmless conjunctivitis to more threatening Conditions Such as Keratitis and uveitis, which can lead to vision loss. Distinguishing between these conditions is essential to ensure prompt management and improve referral accuracy. Knowledge of local epidemiology allows clinicians to fine-tune the diagnostic process and practice epidemiologically based medicine as efficiently as possible, particularly in ophthalmology with scarce resources.

Objectives: To assess the prevalence of conjunctivitis, Keratitis, and uveitis among patients presenting with a red eye, and to evaluate the clinical characteristics, demographics, and primary risk factors that enable early diagnosis, and to analyze the clinical features.

Methodology This Cross Sectional Study Conducted at Department of Ophthalmology, Gajju Khan Medical College Swabi From Jan 2023 To Jan 2024.Patients with unilateral or bilateral red eyes were included once informed consent was obtained. Data were collected on patients' demographics, clinical features, visual acuity, and clinical risk factors. A slit lamp examination, fluorescein staining, and anterior chamber were performed to diagnose conjunctivitis, Keratitis, or uveitis. If needed, intraocular pressure and fundus examinations were performed. SPSS version 24 was used to analyze the data, and frequencies, means, chi-square tests, and p-values were computed at an alpha of 0.05.

Results: A total of one hundred patients with red eyes were assessed. Diagnoses of conjunctivitis were most common (57%). This was followed by keratitis (25%) and then uveitis (18%). Allergic conjunctivitis was most prevalent (40%). For the cases of keratitis, 64% (most were due to an infection), and 22% of the cases were trauma-related. The majority of uveitis cases were anterior (83%) with 17% being of the systemic disease type. Pain and photophobia were strongly associated with keratitis and uveitis ($p < 0.001$). Increased discharge was strongly correlated with conjunctivitis ($p < 0.001$). Most of the conjunctivitis cases improved quickly, however, keratitis needed advanced aggressive antivirals to resolve.

Conclusion: The most common cause of red eyes is conjunctivitis; however, Keratitis and uveitis also significantly contribute to morbidity. There is a much higher likelihood of better outcomes with early diagnosis, understanding of risk factors, and appropriate, timely intervention..

Keywords: Red eye; Conjunctivitis; Keratitis; Uveitis

1. INTRODUCTION

Red eye is commonly seen in ophthalmology and general outpatient clinics worldwide and encompasses a wide range of both non-threatening and threatening causes of vision loss. The phrase `red eye` refers to hyperemia of conjunctival or episcleral vessels, with varying pain presentations and other symptoms, including discharge, photophobia, and vision loss. Due to the complexities of the conditions that cause red eye, it is essential to closely examine the causes of this phenomenon and their frequencies to support accurate, valid reasoning and diagnosis, and to provide interventions to reduce vision loss. Conjunctivitis is the leading cause of red eye, regardless of the patient's age [1,2]. The condition can be caused by an allergy, a virus, or bacteria, and can present with different clinical symptoms, while still overlapping with those of the other causes [3]. Allergic conjunctivitis is seasonal, itchy, and watery, and is common among the general population. On the other hand, viral conjunctivitis is usually caused by adenovirus and results in a watery discharge, a follicular reaction, and swollen lymph nodes in front of the ear. Bacterial conjunctivitis is generally characterized by a slight yellowish to greenish discharge that thickens and causes the eyelids to stick together [4,5]. Although conjunctivitis is mostly a benign condition, inappropriate self-medication with a virus-fighting medication can worsen symptoms. It may also lead to other problems associated with the patient's eye condition. The last condition, Keratitis, is also benign but less common than conjunctivitis [6]. Infectious Keratitis—regardless of the infectious agent—presents with extreme discomfort, light sensitivity, vision loss, and varying degrees of corneal opacity. Trauma, ocular surface disease, and misuse of contact lenses and steroids are the primary risk factors to consider in the inflammatory response of the cornea (Keratitis). If treatment is inadequate or delayed, irreversible visual loss may occur due to corneal scarring, perforation, and inflammatory endophthalmitis. Therefore, the preservation of visual function is directly related to prompt, appropriate treatment of the conditions above [7]. Uveitis is yet another significant condition that may present with a red eye. This condition arises acutely and/or chronically depending on the cause of the segment of the eye. Uveitis is the inflammation of the uveal tract, consisting of the iris, ciliary body, and choroid [8]. It may be anterior, intermediate, posterior, or panuveitis (involving the entire uvea). The most common form is anterior uveitis. You may also present with light sensitivity, eye pain, and underlying vision loss, with consensual photophobia and eye redness around the cornea (circumcorneal congestion). Uveitis may arise without a known cause or be linked to systemic autoimmune diseases, infections, and/or inflammatory diseases. Undiagnosed uveitis is more common in domestic cases, and the diagnostic challenges are more pronounced in low-resource contexts. If uveitis is left untreated, there is a greater risk of several complications, including clouding of the eye lens (cataract); increased pressure in the eye (glaucoma); adhesion of tissues behind the eye (posterior synechiae); and cystoid macular edema (swelling in the macula). In low-resource settings, red eye poses diagnostic challenges due to limited access to advanced diagnostic tools. This is also due to a heavy patient load, an uneven stream of primary healthcare providers, and the common practice of self-medication [9,10].

Research Objectives:

Analysis of demographic characteristics, along with clinical features and risk factors, is essential for evaluating early diagnosis of conjunctivitis, Keratitis, and uveitis, as well as assessing their respective prevalence and the incidence of red eye presentations.

Materials And Methods:

Study Design & Setting:

This Cross Sectional Study Conducted At Department Of Ophthalmology, Gajju Khan Medical College Swabi From Jan 2023 To Jan 2024.

Participants:

An ophthalmology outpatient department of a tertiary care hospital observed patients with red eye using standardized slit lamp-based diagnostic criteria over six months and performed a cross-sectional descriptive study to evaluate the observations.

Sample Size Calculation:

The sample size was calculated using the standard prevalence formula: $n = Z^2 \times p(1-p)\ d^2$. With the assumption of a conjunctivitis prevalence of 50% among red eye cases, a confidence level of 95% and a precision of 7%, the required sample size was estimated to be 196. However, due to time constraints, 180 patients were enrolled.

Inclusion Criteria:

Age 15 years, presenting with red eye; able to undergo a complete slit-lamp examination.

Exclusion Criteria:

Ocular chemical burn or penetrating ocular trauma. Recent eye surgical procedures within the past 3 months. Preexisting glaucoma or chronic ocular surface ailments. Unsuitability based on lack of Approval.

Diagnostic and Management Strategy:

The presence of discharge and conjunctival signs indicated a diagnosis of conjunctivitis. Infiltrates or corneal staining were

required for a diagnosis of Keratitis. Identification of uveitis was based on the presence of keratic precipitates, anterior chamber flare, and cells. Management involved the use of lubricants, antimicrobials, and, in some cases, cycloplegics or steroids; however, in the cases of Keratitis and uveitis, follow-up was mandatory.

Statistical Analysis:

Research outcomes were confirmed through SPSS version 24. Outcomes were summarized using descriptive statistics, including mean, frequency, and standard deviation. Clinical variables and diagnoses associations were tested with chi-square and t-tests. Predictors of Keratitis and uveitis were assessed with logistic regression. Statistical significance was taken with a p-value of 0.05 or less.

Results:

A study was conducted with a sample of 100 patients with red eye. The average age was 35.2 ± 12.4 years. The ratio of participants was composed of 55% male and 45% female. The most common diagnosis was conjunctivitis at 57% of patients. Subtypes of conjunctivitis and their occurrence were allergic conjunctivitis (40%), viral (37%), and bacterial (23%) cases. Keratitis was diagnosed in 25% of cases of the study sample, with an infectious keratitis majority of 64%. The trauma-related keratitis sub-type was at 22% of cases, and the lens associated keratitis was 14% of the infectious cases. Attacks of uveitis were at 18% of the sample, of which 83% were anterior in type. 17% of cases had systemic associations such as an autoimmune disease. Pain and photophobia were common with keratitis and uveitis ($p < 0.001$) while conjunctivitis was strongly associated with a purge of watery (or purulent) discharge ($p < 0.001$). Trauma and contact lens usage were strong predictors of keratitis ($p = 0.03$). Most patients with conjunctivitis improved in short time, but keratitis cases required more careful attention. In uveitis cases, corticosteroids were sufficient for treatment in 92% of cases, with a recurrence of 8%.

Intervention Outcome:

Symptomatic resolution occurred more quickly in patients with conjunctivitis than in those with other conditions. In individuals with Keratitis, however, it was necessary to conduct extended, thorough, and continual observations to determine the effectiveness and necessity of therapy. Concern still existed that a flare could occur with quick, effective administration of corticosteroids and cycloplegics to patients with uveitis. As with other conditions, the early recognition and assessment of risk factors were crucial to improving the management of all red eye conditions.

TABLE 1: Baseline Demographic Characteristics of Patients with Red Eye

Variable	Mean ± SD / n (%)
Total patients	180
Age (years), mean ± SD	34.8 ± 12.6
Male gender	98 (54.4%)
Symptom duration (days), mean ± SD	4.1 ± 2.3
Unilateral involvement	122 (67.8%)
Bilateral involvement	58 (32.2%)

Table 1 presents the baseline demographic characteristics of patients enrolled in the study, including age distribution, gender, and laterality of red eye. These variables provide essential context for interpreting diagnostic patterns and associated clinical features.

TABLE 2: Distribution of Diagnoses Among Red Eye Patients

Diagnosis	n (%)
Conjunctivitis	**105 (58.3%)**
• Allergic	44 (42%)
• Viral	38 (36%)
• Bacterial	23 (22%)
Keratitis	44 (24.4%)
• Infectious	30 (68%)

• Trauma-related	9 (21%)
• Contact lens–related	5 (11%)
Uveitis	31 (17.2%)
• Anterior	24 (78%)
• Systemic association	7 (22%)

Table 2 summarizes the frequency and subtypes of conjunctivitis, keratitis, and uveitis. Conjunctivitis was the predominant diagnosis, while keratitis and uveitis accounted for a substantial proportion of more severe presentations.

TABLE 3: Clinical Symptoms Associated with Each Diagnosis

Clinical Feature	Conjunctivitis (%)	Keratitis (%)	Uveitis (%)	p-value
Pain	22	**91**	**84**	<0.001
Photophobia	12	**88**	**92**	<0.001
Discharge	**78**	19	8	<0.001
Blurred vision	18	**73**	**69**	<0.001
Redness severity (moderate–severe)	41	**89**	**77**	<0.001

Table 3 illustrates symptom profiles across the three major red-eye diagnoses. Pain, photophobia, and blurred vision were dominant features of keratitis and uveitis, while discharge was characteristic of conjunctivitis. These distinguishing features aid in rapid differential diagnosis.

TABLE 4: Risk Factors and Systemic Associations

Risk Factor / Association	Conjunctivitis (%)	Keratitis (%)	Uveitis (%)	p-value
Recent upper respiratory infection	**46**	11	6	0.002
Ocular trauma	7	**21**	3	<0.01
Contact lens use	4	**11**	0	0.01
Autoimmune disease	1	3	**22**	<0.001
Prior steroid use	3	14	9	0.04

Table 4 presents key risk factors associated with each diagnosis. Keratitis showed strong correlations with trauma and contact lens use, while uveitis was significantly associated with systemic autoimmune conditions. These patterns highlight modifiable risks and inform preventive strategies.

2. DISCUSSION:

Eye-related issues are highly prevalent in medicine, and the ability to distinguish among the three aforementioned diseases is vital to avoid severe consequences, including loss of eyesight. In this case, conjunctivitis was determined to be the most common disease, followed by Keratitis and uveitis. Recently, a multitude of epidemiological studies have shown that conjunctivitis proves to be the most common diagnosis within outpatient ocular presentations in various low- and middle-income countries. In the study in question, there was a disproportionately significant amount of allergic conjunctivitis [11]. This was in line with the information presented by Ahmed and colleagues in 2021, who associated the rise in allergic conjunctivitis within the population with increased environmental pollutants in urban areas and the allergens they contain [12]. The number of patients with viral and bacterial conjunctivitis also correlated with the number of patients diagnosed with conjunctivitis on red eye during certain seasons in the South Asian region, coinciding with adenoviral outbreaks [13]. Though Keratitis accounts for fewer cases than conjunctivitis, this study showed that it is responsible for a large number of cases. Infections, most notably, cause Keratitis, and this is supported by studies from East Africa and India, where Keratitis is cited as a major contributor to vision loss. The percent of patients impacted by trauma-related Keratitis and the percent of patients whose Keratitis was associated with contact lenses are behaviors that are considered "high risk" [14]. Impairment of

ocular surface protection due to prolonged lens wear, substandard hygiene practices, and increased use of decorative lenses has led to a worldwide increase in contact lens-related Keratitis. As Ibrahim et al. (2020) have shown, the inappropriate use of contact lenses has also contributed to the incidence of Keratitis among young adults on the African continent. Based on the statistically significant correlation between Keratitis and the symptoms of pain and photophobia, the author has conclusively confirmed the clinical signs of corneal involvement. Of the total eye complications, uveitis accounted for 17.2%, with the majority being anterior (78%) [15,16]. This correlates well with recent studies indicating that anterior uveitis is the most common subtype of uveitis at tertiary health facilities [17]. The 22% association observed with systemic autoimmune disease also aligns with the report by Kaur et al. (2022), which describes at least one-quarter of uveitis cases as having systemic associations. The 9% recurrence rate documented in our cohort of uveitis patients is also well within the range of recent uveitis studies, even with timely corticosteroid treatment, which remains a significant challenge. There is also an association of pain, photophobia, and other visual disturbances with uveitis, and these have been documented in recent comparative studies as characteristic symptoms of uveitis [18].

3. LIMITATIONS:

The research was undertaken in one tertiary care setting, which makes it difficult to apply findings to other settings. Microbiological confirmation of Keratitis was also not performed as standard practice, and the follow-up period for uveitis recurrence was the shortest among other studies. The investigation also did not consider the different seasons that may affect the distribution of conjunctivitis and infectious Keratitis.

4. CONCLUSION:

Injuries or complications due to conjunctivitis, Keratitis, and uveitis can lead to significant long-term disability. Diagnosis becomes significantly easier and more well-tempered with knowledge of key trigger patterns. Given the proper framework, patient education, advancements, and red-eye disorder systems, these systems have the potential to reduce preventable harm significantly.

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Conflict of Interest: Nil

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Authors Contributions

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Final Approval of version: All Mentioned Authors Approved the Final Version..

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