**Pattern and management of Peripheral ulcerative keratitis (PUK) in Bangladeshi patients**

**Abstract:**

**Background:** Peripheral Ulcerative Keratitis (PUK) is a severe, vision-threatening condition characterized by progressive corneal thinning, ulceration, and inflammation. In Bangladesh, PUK is commonly associated with infections, autoimmune disorders, and Mooren’s ulcer, with microbial infections being the leading cause. Limited access to specialized ophthalmic care often results in delayed diagnosis and treatment, increasing the risk of complications. Management strategies include medical therapy with antibiotics, corticosteroids, and immunosuppressants, while severe cases require surgical intervention. Understanding the pattern and treatment outcomes of PUK in Bangladeshi patients is crucial for improving early detection, optimizing management strategies, and reducing the burden of vision loss.

**Objective:** In this study our main goal is to evaluate the pattern and management of peripheral ulcerative keratitis (PUK)in Bangladeshi patients.

**Method:** This observational study was done in the Tertiary Hospital from January 2022 to January 2023. A total of 150 consecutive patients were included. The diagnosis PUK was made on the basis of presence of crescent-shaped destructive inflammation within at least 2 mm of limbus associated with epithelial defect, stromal inflammatory cells and possibly stromal degradation.

**Result** The study found that PUK was more prevalent among males (60%) and most common in the 50–60 age group (35%). The leading cause was microbiological infection (39%), followed by Mooren’s ulcer (32%) and systemic collagen vascular disease (29%). The most frequent symptoms were foreign body sensation (39%) and blurred vision (37%). Visual acuity assessment showed variable improvement post-treatment, with some patients experiencing deterioration, particularly in severe cases. Healing time and medical treatment failure rates increased with disease severity, with 46% of severe cases requiring surgery. While surgical intervention significantly improved BCVA, medical treatment alone showed limited efficacy in advanced cases.

**Conclusion:** In conclusion, this study offers valuable insights into the demographic profile, clinical presentation, and management of peripheral ulcerative keratitis (PUK) among Bangladeshi patients. The findings indicate that PUK predominantly affects middle-aged individuals, particularly those in the 50–60 age group, with a higher prevalence in males. Visual impairment is more pronounced in severe cases, highlighting the importance of early diagnosis and timely intervention. The study also reveals a range of etiological factors, with microbiological infections, Mooren’s ulcer, and systemic collagen vascular diseases being the most common causes. While medical treatment proved effective for mild to moderate cases, severe cases showed prolonged healing times, and surgical management led to significant visual improvement, especially after medical treatment failure. Overall, these results emphasize the need for a comprehensive, multidisciplinary approach to managing PUK, with surgical intervention playing a critical role in improving visual outcomes in severe cases.

**Keyword:** Peripheral ulcerative keratitis (PUK), crescent-shaped destructive inflammation, ocular and systemic pattern.

**Introduction**

Peripheral Ulcerative Keratitis (PUK) is a serious inflammatory condition of the cornea characterized by progressive stromal thinning, epithelial loss, and an overlying immune-mediated or infectious process. 1-4 It often occurs in association with systemic autoimmune diseases such as rheumatoid arthritis, systemic lupus erythematosus, and Wegener’s granulomatosis. PUK can also result from infectious causes, including bacterial, viral, fungal, and parasitic pathogens. 5 If left untreated, it can lead to corneal perforation, severe visual impairment, or even blindness. Despite its global prevalence, regional variations in etiology, clinical presentation, and management outcomes make it essential to study the disease in specific populations, including Bangladesh.

In Bangladesh, where ocular infections and autoimmune diseases remain significant public health concerns, PUK is a major cause of vision-threatening complications. Socioeconomic factors, limited access to specialized ophthalmic care, and delays in diagnosis contribute to poor outcomes in many patients. Additionally, environmental and occupational exposures, such as air pollution, prolonged sunlight exposure, and unhygienic practices, may increase the risk of corneal infections and inflammation in this region. However, data on the pattern, risk factors, and treatment outcomes of PUK among Bangladeshi patients remain limited, necessitating further investigation.

Management of PUK requires a multifaceted approach, including aggressive medical therapy, surgical intervention in severe cases, and treatment of any underlying systemic conditions. Corticosteroids, immunosuppressive agents, and antibiotics are commonly used to control inflammation and infection, while surgical procedures like corneal transplantation or amniotic membrane grafting may be required in advanced cases. 6-9 However, the choice of treatment often depends on disease severity, access to healthcare, and patient compliance, which vary significantly across different populations. Understanding the effectiveness of various management strategies in Bangladeshi patients is crucial for optimizing treatment protocols and improving patient outcomes.

The prognosis of PUK largely depends on early diagnosis and appropriate intervention. Studies from other countries have demonstrated that a combination of medical and surgical management can significantly improve visual outcomes and reduce disease recurrence. 10 However, in Bangladesh, where ophthalmic healthcare resources may be limited in rural areas, the accessibility of specialized treatments remains a challenge. Identifying the primary causes, risk factors, and response to treatment in local patients can help develop targeted strategies for more effective management.

This study aims to explore the clinical patterns, risk factors, and management outcomes of PUK in Bangladeshi patients. By analyzing demographic data, clinical characteristics, treatment responses, and visual outcomes, we seek to provide valuable insights into the current trends of PUK in Bangladesh. The findings may help inform clinical guidelines and public health policies to improve early detection and treatment approaches, ultimately reducing the burden of this sight-threatening condition.

**Objective**

To analyze the pattern, clinical presentation, and management outcomes of Peripheral Ulcerative Keratitis (PUK) in Bangladeshi patients.

**Methodology**

This observational study was conducted at a tertiary hospital over a one-year period, from January 2022 to January 2023, and focused on 150 consecutive patients diagnosed with peripheral ulcerative keratitis (PUK. Participants were selected through purposive sampling, ensuring inclusion based on specific clinical presentations and disease characteristics observed at the hospital.

The diagnosis of PUK was established by identifying crescent-shaped destructive inflammation within at least 2 mm of the limbus, accompanied by an epithelial defect, stromal inflammatory cell infiltration, and potential stromal degradation. In addition to these clinical findings, a detailed patient profile—including demographic variables such as age, sex, and socioeconomic status—was documented. A thorough medical history was obtained, encompassing the duration and nature of symptoms, systemic associations, and any prior treatments received.

Comprehensive ocular examinations were performed, with a primary focus on best corrected visual acuity (BCVA) assessment and meticulous slit-lamp evaluation. The affected quadrant of the cornea (nasal, temporal, superior, or inferior) was noted, along with the extent of the epithelial defect, infiltration, and stromal thinning. Measurements were recorded in clock hours, both in the largest and smallest meridians, to assess the depth of corneal involvement accurately.

For statistical analysis, data were processed using SPSS (Statistical Package for Social Sciences) version 22 for Windows. Quantitative variables were compared using an unpaired t-test, with results expressed as ranges and mean ± standard deviation (SD), considering a p-value of <0.05 statistically significant. Where applicable, advanced statistical methods—including the Student’s t-test, Pearson’s correlation coefficient test, multivariate logistic regression analysis, and Fisher’s exact test—were employed to ensure a robust and comprehensive evaluation of the data.

**Result**

The study included patients aged 30 to 70 years, with the highest proportion (35%) in the 50–60 age group. Males accounted for 60% of the cases, indicating a higher prevalence of PUK among men. Baseline investigations revealed a mean random blood sugar level of 12.5 ± 5.5 mmol/L, serum creatinine of 1.0 ± 0.5 mg/dL, total cholesterol of 209.0 ± 48.7 mg/dL, and LDL-C of 115.6 ± 23.3 mg/dL. The most commonly reported symptom was blurred vision (37%), followed by foreign body sensation (39%) and sensitivity to bright light (24%). Regarding etiology, microbiological infection was the leading cause (39%), followed by Mooren’s ulcer (32%) and systemic collagen vascular disease (29%).

**Table 1: Demographic, Clinical, and Etiological Characteristics of Patients with Peripheral Ulcerative Keratitis (PUK)**

|  |  |
| --- | --- |
| **Parameter** | **Data** |
| **Age Distribution** | **Years** |
| **30-40** | **12** |
| **40-50** | **30** |
| **50-60** | **35** |
| **60-70** | **23** |
| **Gender Distribution** | **Percentage** |
| **Male:** | **40%** |
| **Female** | **60%** |
| **Baseline Investigations (n=100)** |  |
| **- Mean Random Blood Sugar (mmol/L)** | **12.5 ± 5.5** |
| **- Serum Creatinine (mg/dl)** | **1.0 ± 0.5** |
| **- Total Cholesterol (mg/dl)** | **209.0 ± 48.7** |
| **- LDL-C (mg/dl)** | **115.6 ± 23.3** |
| **Symptoms of PUK** |  |
| **- Blurred vision** | **37%** |
| **- Sensitivity to bright light** | **24%** |
| **- Foreign body sensation** | **39%** |
| **Common Etiology of PUK** |  |
| **- Microbiological Infection** | **39%** |
| **- Mooren’s Ulcer** | **32%** |
| **- Systemic Collagen Vascular Disease** | **29%** |

The results indicate variations in visual acuity before and after treatment in Group 1, as well as the baseline visual acuity in Group 2. In Group 1, before treatment, 14 patients had BCVA ≥6/18, which reduced to 8 after treatment. Patients with BCVA <6/18 to ≥6/60 increased from 4 to 7, and those with BCVA <6/60 to ≥3/6 increased from 1 to 6, suggesting some improvement in moderate visual impairment. However, the number of patients with severe visual impairment (BCVA <3/60) also increased from 3 to 6 post-treatment, indicating that while some patients showed improvement, others experienced deterioration. In Group 2, before treatment, only 4 patients had BCVA ≥6/18, while 3 had BCVA <6/18 to ≥6/60, 12 had BCVA <6/60 to ≥3/6, and 20 had BCVA <3/60, suggesting that this group started with a higher proportion of severe visual impairment compared to Group 1.

**Table 4: Visual acuity of patients**

|  |  |  |  |
| --- | --- | --- | --- |
| **Visual acuity** | **Before treatment Group -1** | **After treatment, Group -1** | **Before treatment, Group-2** |
| BCVA≥6/18 | 14 | 8 | 4 |
| BCVA <6/18 to≥6/60 | 4 | 7 | 3 |
| BCVA <6/60 to≥3/6 | 1 | 6 | 12 |
| BCVA <3/60 | 3 | 6 | 20 |

The study results indicate that the mean duration of healing increased with disease severity, with mild cases healing in approximately 7.89±2.13 days, moderate cases in 17.39±5.65 days, and severe cases in 34.78±11.68 days. Medical treatment failure rates were highest in severe cases (51%), followed by moderate (30%) and mild (7%) cases. While no mild or moderate cases required primary surgical intervention, 46% of severe cases underwent surgery. Anatomical success rates were highest in mild cases (90%), slightly lower in moderate cases (87%), and lowest in severe cases (80%). Recurrence rates increased with severity, recorded at 0.3% in mild, 5% in moderate, and 9% in severe cases. In terms of visual outcomes, the mean Best Corrected Visual Acuity (BCVA) improved slightly across all groups post-treatment. Severe cases had the lowest baseline BCVA (0.03±0.008), improving to 0.13±0.04 post-treatment. Moderate cases improved from 0.27±0.06 to 0.31±0.11, while mild cases showed the best improvement, from 0.48±0.13 to 0.54±0.21. When comparing treatment approaches, primary surgical cases demonstrated significant BCVA improvement (0.03±0.03 to 0.14±0.04, p=0.001), as did medical cases followed by surgery (0.10±0.07 to 0.21±0.09, p=0.0012). However, cases managed only medically in the severe and moderate groups showed no significant improvement (0.19±0.10 to 0.19±0.06, p=0.360). These findings highlight the greater need for surgical intervention in severe cases and the limited efficacy of medical treatment alone in advanced stages.

**Table 5: Management, Outcome, and Visual Acuity in Patients with PUK**

|  |  |  |  |
| --- | --- | --- | --- |
| **Outcome** | **Mild diseases** | **Moderate diseases** | **Severe diseases** |
| Mean duration of healing (days) | 7.89±2.13 | 17.39±5.65 | 34.78±11.68 |
| Medical treatment failure | 7% | 30% | 51% |
| Primary surgical management | 0% | 0% | 46% |
| Anatomical success | 90% | 87% | 80% |
| Recurrence | .3% | 5% | 9% |
| Visual outcome  Mean pretreatment BCVA:  Mean post-treatment BCVA: | 0.48±0.13  0.54±0.21 | 0.27±0.06  0.31±0.11 | 0.03±0.008  0.13±0.04 |
| **Visual acuity** | **Mean pretreatment BCVA** | **Mean post-treatment BCVA** | **p Value** |
| Primary surgical | 0.03±0.03 | 0.14±0.04 | 0.001 |
| Medical followed by surgical treatment | 0.10±0.07 | 0.21±0.09 | 0.0012 |
| Only medically treated cases in severe+moderate cases | 0.19±0.10 | 0.19±0.06 | 0.360 |

**Discussion**

The demographic and clinical findings from this study on peripheral ulcerative keratitis (PUK) provide valuable insights into the disease's patterns and management. Our findings show that the majority of PUK patients were in the 50-60 age group, which aligns with other studies that suggest a higher prevalence of PUK among middle-aged to elderly individuals. This age group is commonly affected by systemic conditions such as autoimmune disorders or infections, which are known risk factors for PUK. The age distribution seen here is consistent with previous research, which also observed a similar pattern of increased prevalence among older populations. 10 However, our study reports a somewhat lower prevalence in the 30-40 age group compared to other studies, which have sometimes reported cases in younger individuals due to genetic factors or the presence of systemic diseases like rheumatoid arthritis or systemic lupus erythematosus.

The gender distribution in this study, with a predominance of males, is comparable to studies which noted a higher incidence of PUK in men, possibly due to occupational risks or differences in immune response. 11 However, the degree of male predominance in our cohort is slightly higher than some studies that found a more balanced gender distribution. This male predominance might reflect regional or socioeconomic differences in healthcare access or risk exposure.

Our findings also show a notable association between elevated blood sugar and the occurrence of PUK, which may suggest a potential link between diabetes and PUK, a hypothesis supported by previous research. Studies have pointed out that systemic factors like diabetes can increase susceptibility to infections and autoimmune conditions, thus contributing to the development of PUK. 12-14

In terms of symptoms, blurred vision, sensitivity to bright light, and a sensation of a foreign object in the eye were the most common complaints in our cohort. These symptoms are consistent with other studies, including those which reported similar symptoms in PUK patients. 15 The distressing nature of these symptoms underscores the need for early intervention to alleviate discomfort and prevent progression to severe disease, which can lead to significant visual impairment.

The most common etiologies of PUK in our study were microbiological infections, Mooren's ulcer, and systemic collagen vascular diseases. These results align with findings from other studies, which also identified microbiological infection and autoimmune diseases as key contributors to PUK. 10 However, differences in the distribution of these etiologies could be attributed to regional variations in the prevalence of specific infections or autoimmune diseases.

Regarding the management and outcomes of PUK, our results highlight that medical treatment alone may not always lead to timely healing, especially in severe cases. The mean healing time for severe cases treated medically was 34.78±11.68 days, which is comparable to studies, which also found extended healing periods for severe PUK. 9 Moreover, surgical intervention demonstrated significant visual improvement, particularly in cases where medical treatment failed. This finding is consistent with the work, who reported that surgery after medical management failure resulted in better visual outcomes in PUK patients. 9 Our study further emphasizes the importance of surgical intervention in severe cases, where significant visual improvement was observed with a p-value of 0.001.

In summary, the findings from our study are generally consistent with those from other studies, particularly in terms of age distribution, gender prevalence, symptomatology, and the role of systemic factors like diabetes in the development of PUK. However, the regional differences in healthcare access and socioeconomic status may contribute to variations in the clinical presentation and management of the disease. This study further highlights the importance of early diagnosis and intervention, as well as the significant role of surgical management in improving visual outcomes for severe PUK cases.

**Conclusion**

The study highlights key demographic, clinical, and treatment-related outcomes in patients with peripheral ulcerative keratitis (PUK). The majority of patients were aged 50–60 years, with a male predominance (60%). Systemic factors, including elevated blood sugar and cholesterol levels, were common, suggesting possible associations with PUK. Microbiological infections were the leading cause (39%), followed by Mooren’s ulcer (32%) and systemic collagen vascular disease (29%). Symptomatically, blurred vision (37%) and foreign body sensation (39%) were the most frequent complaints. Disease severity significantly influenced healing duration, treatment failure, and visual outcomes. While mild cases healed within approximately 8 days, severe cases took over a month. Medical treatment alone was ineffective in advanced cases, with a failure rate of 51%, necessitating surgical intervention in 46% of severe cases. Anatomical success was highest in mild cases (90%) but decreased with severity (80% in severe cases), and recurrence rates increased accordingly. Visual acuity outcomes showed modest improvement across all groups, with primary surgical cases achieving the most significant gains (p=0.001), whereas cases managed only medically in moderate-to-severe stages showed no significant improvement (p=0.360). These findings underscore the necessity for timely intervention, the limited effectiveness of medical treatment in advanced disease, and the critical role of surgical management in improving outcomes in severe PUK cases.

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