

# INTEGRATED APPROACH TO THE TREATMENT OF CORNEAL ULCERS IN EARLY CHILDHOOD

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**Abstract.** *This article presents data from a study on optimizing the comprehensive treatment of corneal ulcers in children. The authors present data on the effectiveness of combined approaches to accelerate healing, reduce ocular inflammation, and prevent corneal opacification. From 2023 to 2025, 265 patients with inflammatory corneal diseases were hospitalized in the ophthalmology department of the Tashkent Pediatric Medical Institute (TashPMI). Of these, 87 (32.8%) children were diagnosed with corneal ulcers, and 178 (67.2%) had keratitis of various origins.*

**Keywords:** *eye diseases in children, corneal opacities, corneal ulcers, inflammatory process.*

## Introduction

It is widely acknowledged that corneal problems pose a significant threat to children. The development of eye diseases and vision loss in children is one of the main causes. Corneal diseases are known to be a major factor leading to vision loss and the development of ophthalmological pathologies in children. Corneal inflammation, or keratitis, accounts for 3-10% of all eye inflammations in children [1, 2, 3, 4]. In pediatric ophthalmology, keratitis is diagnosed in 11-13% of cases of inflammatory processes in the anterior segment of the eye and is often severe, with a risk of serious complications, especially in young children [4, 5].

Research has consistently demonstrated that corneal ulcer is a lesion of the outer membrane of the eyeball. A study of local and international literature revealed that the causes of this condition can be divided into endogenous and exogenous. Corneal ulcers are most often caused by infectious diseases, primarily caused by bacteria (*Staphylococcus aureus*, *gonococcus*, *E. coli*), fungi, and viruses (Shipiguzova S.A., 2021) [14]. According to research by a number of authors, in addition to being an independent nosological entity, a corneal ulcer can be considered both a complication and a course of keratitis, with the progression of destructive processes in the cornea in terms of penetration depth and damage area as a result of untimely and ineffective treatment [5,6,7]. It can be clearly observed that research in recent years shows, corneal ulcers are less common in young children; however, they are associated with a worse prognosis, often leading to persistent corneal opacity and decreased vision.

By etiology, corneal ulcers are divided into:

- traumatic injuries;
- congenital corneal anomalies;
- complications following keratitis [1,2,8,9].

The numerous studies on corneal ulcers have been conducted recently, but modern ophthalmology lacks a unified, standard approach to treating corneal ulcers in children. Various therapeutic regimens are used, including drug therapy, keratoprotectors, vitamins, and antimicrobials. However, the effectiveness of these protocols remains variable, and the risk of

scarring and loss of corneal transparency remains [4,9,10,11,12]. It is evident from the data that difficulties in diagnosing corneal ulcers in young children primarily arise due to age-related lipids and the inability to perform standard ophthalmological examinations, such as biomicroscopy and tonometry. Follow-up is also difficult, which hinders the timely assessment of treatment effectiveness [13,14].

**Aim of the research:** For improving the effectiveness of comprehensive treatment for corneal ulcers in young children by using combined techniques aimed at activating reparative cycles, eliminating the inflammatory response, and preventing corneal cicatricial changes.

**Materials and methods:** The study included 265 patients hospitalized in the Ophthalmology Department of the Tashkent Pediatric Medical Institute Clinic between 2023 and 2025 with a diagnosis of inflammatory corneal diseases. Corneal ulcers were diagnosed in 87 patients (32.8%), and keratitis of various etiologies was diagnosed in 178 patients (67.2%).

The study inclusion criteria were as follows:

- Presence of a clinically confirmed corneal ulcer;
- Patients were aged 7 years or younger;
- No congenital visual anomalies that could affect corneal assessment [15, 16, 17].

The exclusion criteria included:

- Presence of systemic infectious or autoimmune diseases that could affect corneal recovery;
- Severe congenital eye pathologies, such as aniridia or microphthalmos;
- Individual intolerance to the medications used.

The findings indicate that due to hospitalization, all children underwent a comprehensive ophthalmological examination. This included a visual examination, a detailed biomicroscope examination of the anterior segment of the eye, a corneal sensitivity test, and a determination of visual acuity based on the child's age. Using an Icare tonometer, intraocular pressure was measured in children [11, 16, 18].

The following laboratory tests were performed in the children:

- complete blood count;
- urinalysis;
- stool analysis;
- glucose level changes;
- TORCH infection screening;
- ASL-O tests;
- rheumatic tests;
- C-reactive protein levels.

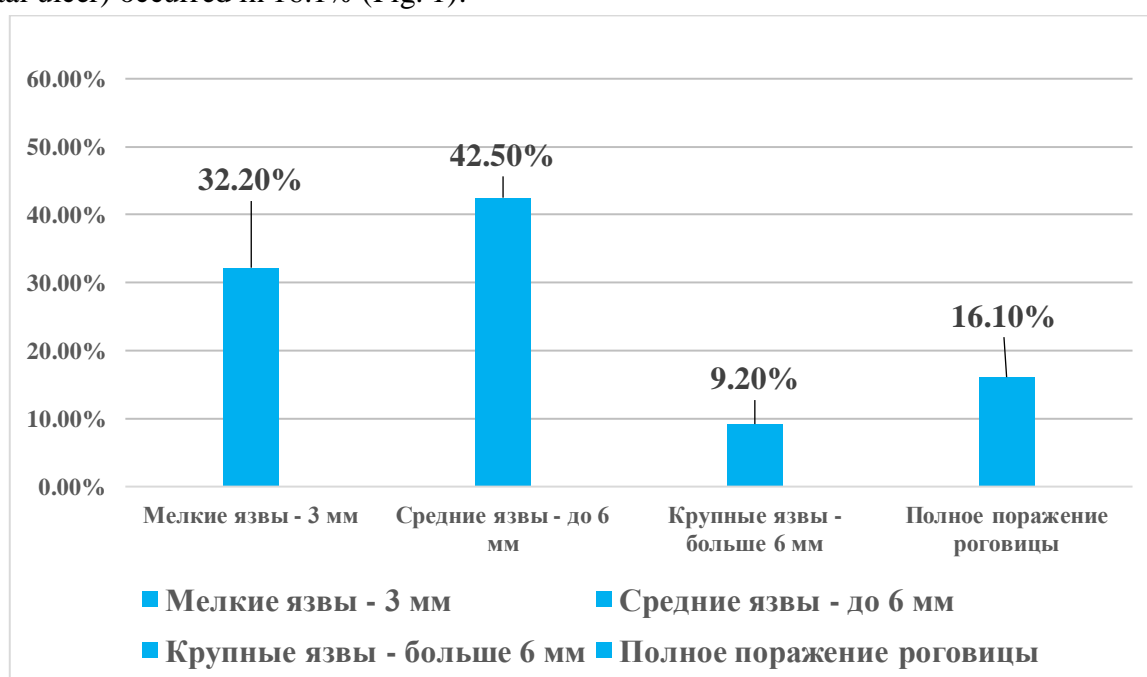
The goal of these diagnostic measures was to establish the cause of the corneal ulcer and identify concomitant infectious, inflammatory, or systemic pathologies influencing disease progression [18, 19, 20].

**Results and discussion.** In 87 patients with corneal ulcers, the study was conducted using the classification (A.A. Kasparova 2000). Superficial, deep, and perforative forms were identified, the latter requiring surgical intervention. Superficial corneal ulcers were characterized by limited damage to the anterior stromal and epithelial layers, as well as a moderate inflammatory reaction, while maintaining transparency of the deep corneal layers.

The following clinical manifestations were observed in 24 patients (27.6%) with corneal ulcers:

- minor infiltration in the perilesional zone;
- vascular injection;
- epithelial edema.

Deep corneal ulcers with damage to the deep stromal layers were detected in 51 patients (58.6%). This was manifested by severe perilesional inflammation, corneal opacity, and edema. Perforating ulcers were detected in 12 patients (13.8%). This condition was characterized by total stromal melting with corneal perforation, iris prolapse, and the formation of anterior synechiae. This group of patients experienced severe pain, photophobia, lacrimation, and a sharp decrease in visual acuity, necessitating immediate surgical intervention. It is generally accepted that among the children examined, 32.2% had small corneal ulcers up to 3 mm in diameter. Medium-sized ulcers, ranging from 3 to 6 mm, accounted for 42.5% of cases. Larger lesions, exceeding 6 mm in diameter, were observed in 9.2% of patients, and complete damage to the entire corneal surface (total ulcer) occurred in 16.1% (Fig. 1).



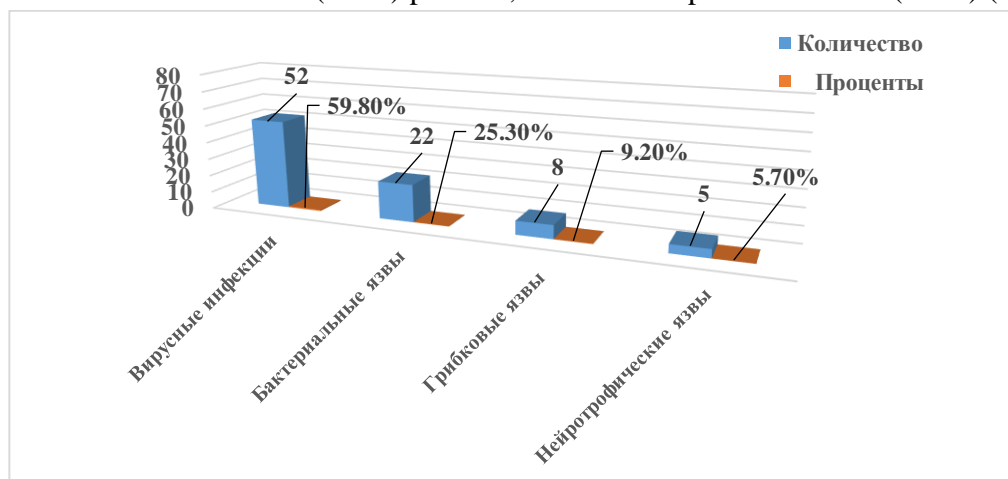
**Figure 1. Corneal Ulcer Sizes**

By location, corneal ulcers were most often found in the central region of the eye (55.2%). Ulcers were observed in the paracentral zone in 33.3% of children, while those in the periphery occurred in only 11.5%. Central corneal ulcers were associated with decreased visual acuity, a slower progression, and a high risk of developing persistent scarring in the optic zone. Paracentral ulcers were characterized by moderate corneal transparency impairment and a relatively favorable clinical prognosis with timely treatment. Peripheral ulcers typically manifested with less pronounced clinical symptoms and resulted in the formation of a limited scar without significant impact on visual function. It has been shown through analysis that most patients with corneal ulcers had concomitant inflammatory changes in the anterior segment of the eye.

Conjunctival hyperemia, corneal edema, and ulcer margin infiltration were observed in almost all cases. Hypopyon of varying severity was detected in 26 children (29.9%), most often with deep and perforated ulcers. Corneal angiomas were observed in 34 patients (39.1%). In some cases, this condition led to the formation of cicatricial opacities and irreversible changes in the cornea, ultimately causing a significant and persistent reduction in visual acuity. Secondary glaucoma also developed in 7 patients (8.0%). This complication was associated with impaired

aqueous humor outflow, adhesions between the iris and cornea, and iris deformation. In some cases, penetrating ulcers resulted in iris prolapse and corneal opacity, requiring prompt surgical treatment.

The literature reveals that analysis of the causes of corneal ulcers in children revealed that viral infections were the most common cause, occurring in 52 cases (59.8%). Viral ulcers typically manifested as superficial or moderately deep lesions. Bacterial ulcers, identified in 22 cases (25.3%), were characterized by a more acute course, severe inflammation (infiltration), purulent discharge, and often resulted in the formation of pus in the anterior chamber (hypopyon). Bacterial infections often affected the deep layers of the cornea, causing significant opacification. Fungal ulcers exhibited a chronic, indolent course with jagged edges and a dense, grayish-white infiltrate. Fungal ulcers were detected in 8 (9.2%) patients, and neurotrophic ulcers in 5 (5.7%) (Fig. 2).



**Figure 2. Causes of Corneal Ulcers**

It is necessary to highlight the fact that depending on the therapy used, patients with corneal ulcers were stratified into two groups: a control group and a study group. The control group, representing the traditional treatment approach, received standard therapy, including systemic antibiotics and anti-inflammatory drugs. The study group of patients, who received an experimental complex treatment protocol, in addition to standard therapy, also received:

- Systemic administration of antifungal drugs, epithelialization stimulators, and vitamin complexes (B vitamins or multivitamins);
- Topical administration of a similar range of medications – antibiotics, antiviral, antifungal, anti-inflammatory, and moisturizing solutions.

Patients in the study group demonstrated more pronounced clinical improvement: accelerated corneal epithelialization, reduced infiltration and edema, and a shorter time interval for the inflammatory response to resolve. Critical analysis has revealed that patients receiving combination therapy including epithelializing and vitamin supplements (the study group) demonstrated a statistically significant reduction in the incidence of complications, such as neovascularization and fibrosis in the optic zone of the cornea. Furthermore, a more pronounced restoration of corneal optical transparency was observed. The incidence of inflammatory recurrence during the three-month follow-up was significantly lower in the study group (6.8%) compared to the control group (18.4%). Therefore, this approach to corneal ulcer therapy promotes intensification of reparative processes, protection from complications, and optimization of functional outcomes.

**Conclusion.** It is a well-established fact that analysis of inflammatory corneal diseases in children revealed that ulcerative forms account for 32.8% of all cases. Viral etiology was the dominant etiology among ulcers, reaching 59.8%, confirming the leading role of viral infections in the pathogenesis of pediatric corneal lesions. The most unfavorable course of the disease was observed with deep and perforated ulcers, especially those located centrally. These conditions were accompanied by severe inflammation, decreased corneal transparency, and a high risk of developing persistent cicatricial changes. The inclusion of epithelializing agents and B vitamins in combination therapy, along with antibacterial, antiviral, antifungal, and anti-inflammatory drugs, contributed to accelerated epithelialization, reduced the inflammatory response, and decreased the incidence of complications.

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