Section: Miscellaneous

Original Research Article

PROSPECTIVE MONITORING OF ANTIBIOTIC RESPONSE IN BACTERIAL CONJUNCTIVITIS CASES

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ABSTRACT

Background: Bacterial conjunctivitis is one of the most common ocular infections encountered in clinical practice and accounts for a significant proportion of outpatient ophthalmology visits. Although the condition is often self-limiting, topical antibiotics are frequently prescribed to hasten symptom resolution, reduce transmissibility, and improve patient comfort. Variability in clinical presentation, empiric antibiotic selection, and patient response highlights the importance of systematically evaluating treatment outcomes under routine care conditions. Prospective monitoring of antibiotic response provides valuable insight into real-world effectiveness and supports rational antimicrobial use in tertiary care settings. The aim of this study was to prospectively monitor the clinical response to antibiotic therapy in patients diagnosed with bacterial conjunctivitis at a tertiary care hospital.

Materials and Methods: This prospective observational study included 94 patients clinically diagnosed with bacterial conjunctivitis. Patients of either gender presenting with signs suggestive of bacterial conjunctivitis and initiated on topical antibiotic therapy were enrolled. Diagnosis was based on ophthalmological evaluation, including conjunctival hyperemia, purulent or mucopurulent discharge, eyelid sticking, foreign body sensation, and ocular irritation. Patients with viral or allergic conjunctivitis, ocular trauma, chronic ocular surface disease, or prior antibiotic use were excluded. Antibiotic therapy was prescribed according to institutional practice and clinician discretion. Patients were followed prospectively to assess treatment response. Primary outcomes included improvement or resolution of clinical signs and symptoms, categorized as complete, partial, or no response. Secondary outcomes included need for change in therapy and occurrence of adverse drug reactions. Data were analyzed using SPSS version 26.0.

Results: Among the 94 patients, males constituted 55.32% and females 44.68%. The most affected age group was 21–40 years (38.30%). Conjunctival hyperemia was present in all patients, while purulent or mucopurulent discharge was observed in 93.62%. Fluoroquinolones were the most commonly prescribed antibiotics (46.81%), followed by aminoglycosides (27.66%). A complete clinical response was achieved in 70.21% of patients, partial response in 21.28%, and no response in 8.51%. No statistically significant association was observed between gender and treatment outcome ($p = 0.512$).

Conclusion: The study demonstrates a high overall clinical response to topical antibiotic therapy in bacterial conjunctivitis. Prospective monitoring facilitates early identification of non-responders and supports effective and rational antibiotic use in tertiary care ophthalmic practice.

Keywords: Bacterial conjunctivitis; Antibiotic therapy; Prospective study; Clinical response.

INTRODUCTION

Bacterial conjunctivitis is a common external ocular infection characterized by inflammation of the conjunctival mucosa and is frequently encountered across outpatient and emergency settings. It contributes substantially to patient discomfort, work or school absenteeism, and healthcare utilization, with many cases initially managed at the primary-care level rather than by ophthalmologists.[1] Clinically, patients typically present with acute-onset redness, foreign body sensation, irritation, and discharge that may range from mucopurulent to frankly purulent, often accompanied by eyelid sticking on waking.[1] Although the condition is usually self-limiting, its high transmissibility and the practical need for rapid symptom control often drive early treatment decisions.[2] The etiological spectrum of conjunctivitis includes viral, bacterial, and allergic causes, with overlapping symptoms that can make bedside differentiation challenging. This diagnostic uncertainty is important because unnecessary antibiotic exposure increases cost, can cause local intolerance, and contributes to antimicrobial resistance. Contemporary clinical guidance emphasizes a structured assessment for severity, laterality, discharge quality, pain, photophobia, vision changes, contact lens use, and features suggestive of keratitis or hyperacute infection, as these factors influence both urgency of referral and empiric therapy choices. In routine practice, clinicians often rely on syndromic diagnosis, reserving culture and sensitivity testing for severe, recurrent, chronic, immunocompromised, neonatal, contact lens–associated, or treatment-unresponsive cases.[3] The microbiology of bacterial conjunctivitis varies with age, setting, comorbidity, and local epidemiology. Common pathogens include Staphylococcus aureus, coagulase-negative staphylococci, Streptococcus pneumoniae, and Haemophilus influenzae, while Gram-negative organisms such as Pseudomonas aeruginosa are particularly relevant in contact lens wearers. These differences are clinically meaningful because they affect the likelihood of spontaneous resolution, the expected symptom trajectory, and the probability of failure with narrower-spectrum agents. Furthermore, co-infections, polymicrobial colonization, and misclassification of viral disease as bacterial can confound perceived antibiotic response in real-world settings.[4] Topical antibiotics remain widely used because they can shorten symptom duration modestly, reduce bacterial load, and facilitate earlier return to normal activities, particularly when clinical features strongly suggest bacterial infection or when rapid improvement is expected for social and occupational reasons. Guidance commonly recommends avoiding prolonged or recurrent topical antimicrobial use whenever possible, encouraging supportive care measures and careful review if early improvement does not occur. In practice, antibiotic selection may include fluoroquinolones, aminoglycosides, macrolides, polymyxin combinations, or other agents depending on availability and clinician preference, balancing broad coverage with safety, tolerability, dosing convenience, and cost.[3] A critical challenge in the management of bacterial conjunctivitis is the evolving landscape of antimicrobial susceptibility among ocular isolates. Surveillance work has demonstrated that resistance is not rare, particularly among staphylococcal organisms, and that methicillin-resistant strains can show reduced susceptibility across multiple antibiotic classes.[5] The Ocular Tracking Resistance in U.S. Today (TRUST) program highlighted patterns of susceptibility and the limited activity of some agents against resistant staphylococci, illustrating why empiric therapy may fail in a subset of cases despite apparently appropriate prescribing. Similarly, the Antibiotic Resistance Monitoring in Ocular Microorganisms (ARMOR) surveillance has reported high methicillin resistance rates among ocular staphylococcal isolates and frequent multidrug resistance among methicillin-resistant strains, reinforcing the need for rational prescribing and timely reassessment in non-responders.[5] Importantly, conjunctival-sourced resistance data also show that while resistance may remain substantial, trends can vary by organism and antibiotic class, and resistance does not necessarily rise uniformly over time.[6] These findings suggest that local prescribing practices, infection-control behaviors, and stewardship efforts may influence outcomes, and that monitoring response in routine clinical care provides complementary information to laboratory surveillance.[6] From a practical standpoint, a patient's clinical course—whether redness, discharge, discomfort, and lid edema improve promptly or persist—often determines whether clinicians continue therapy, switch agents, add combination coverage, or escalate evaluation for alternate diagnoses such as viral conjunctivitis, allergic disease, blepharitis-related inflammation, nasolacrimal obstruction, or early keratitis. Prospective monitoring of antibiotic response is therefore valuable for several reasons. First, it helps quantify real-world effectiveness of commonly prescribed regimens in a tertiary-care setting where case-mix may include more severe presentations, prior intermittent self-medication, and referrals after initial non-response. Second, it supports early identification of patterns suggestive of inadequate coverage or resistant organisms such as persistent mucopurulent discharge, ongoing hyperemia, and minimal symptomatic relief prompting timely modification of therapy and consideration of microbiological testing. Third, structured follow-up allows documentation of adverse effects and adherence barriers, both of which can influence apparent treatment failure. Finally, systematic evaluation of response using consistent clinical parameters aligns with stewardship principles by

reducing unnecessary prolonged antibiotic exposure, promoting reassessment, and encouraging targeted treatment in those most likely to benefit.[7]

MATERIALS AND METHODS

This was a prospective observational study conducted at a tertiary care hospital to monitor the clinical response to antibiotic therapy in patients diagnosed with bacterial conjunctivitis. The study was designed to systematically observe treatment outcomes under routine clinical practice conditions without altering the standard management protocols followed at the institution. A total of 94 patients clinically diagnosed with bacterial conjunctivitis were enrolled in the study. Patients of either gender presenting with signs and symptoms suggestive of bacterial conjunctivitis and for whom topical antibiotic therapy was initiated were included. Patients with viral or allergic conjunctivitis, ocular trauma, chronic ocular surface disease, concurrent ocular infections, or those already on antibiotic treatment prior to presentation were excluded to avoid confounding of treatment response.

Methodology: The diagnosis of bacterial conjunctivitis was established based on clinical evaluation by an ophthalmologist. Diagnostic features included conjunctival hyperemia, purulent or mucopurulent discharge, eyelid sticking, foreign body sensation, and absence of features suggestive of viral or allergic etiology. Microbiological investigations were performed where clinically indicated, following standard aseptic techniques.

Patients received topical antibiotic therapy as per institutional treatment guidelines and clinician discretion. The choice of antibiotic, dosage, and frequency were recorded. Patients were prospectively monitored for clinical response to therapy through follow-up evaluations. Compliance with prescribed treatment was assessed by patient self-reporting and review of medication use during follow-up visits.

The primary outcome was clinical response to antibiotic therapy, assessed through improvement or resolution of key clinical parameters. These parameters included reduction in conjunctival redness, decrease in ocular discharge, relief from irritation or discomfort, reduction in eyelid edema, and overall clinical recovery. Secondary parameters included time to noticeable symptom improvement, need for change or escalation of antibiotic therapy, and occurrence of any adverse drug reactions. Treatment outcomes were categorized as complete response, partial response, or no response based on predefined clinical criteria.

Data were collected using a structured case record form. Demographic details, clinical presentation, treatment details, follow-up findings, and outcome measures were systematically documented. All collected data were checked for completeness and consistency prior to analysis.

Statistical Analysis

Data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) software version 26.0. Descriptive statistics were used to summarize demographic and clinical characteristics. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as mean and standard deviation. Appropriate inferential statistical tests were applied to assess associations between clinical parameters and treatment outcomes, with a p-value of less than 0.05 considered statistically significant.

RESULTS

Demographic characteristics of study participants [Table 1]

[Table 1] summarizes the demographic profile of the 94 patients included in the study. A slightly higher proportion of patients were male (55.32%) compared to female patients (44.68%), indicating a mild male predominance in bacterial conjunctivitis cases presenting to the tertiary care hospital. With respect to age distribution, the highest number of patients belonged to the 21–40 years age group, accounting for 38.30% of the study population. This was followed by patients aged 41–60 years (29.79%). Younger patients aged ≤20 years constituted 19.15% of cases, while elderly patients above 60 years represented the smallest group (12.76%).

Baseline clinical presentation [Table 2]

The baseline clinical features observed in the study population are detailed in [Table 2]. Conjunctival hyperemia was present in all patients (100.00%), making it the most consistent and universal clinical finding. Purulent or mucopurulent discharge was observed in 93.62% of patients, reinforcing the clinical diagnosis of bacterial conjunctivitis. Ocular irritation or discomfort was reported by 87.23% of patients, while foreign body sensation was noted in 80.85%. Eyelid sticking, particularly noticeable on waking, was present in 74.47% of cases. Eyelid edema was observed in slightly more than half of the patients (51.06%), indicating variable severity of inflammation among the study participants.

Antibiotic therapy prescribed [Table 3]

[Table 3] describes the pattern of antibiotic prescriptions used in the management of bacterial conjunctivitis. Fluoroquinolones were the most commonly prescribed antibiotics, used in 46.81% of patients, reflecting their broad-spectrum activity and favorable clinical efficacy. Aminoglycosides were prescribed in 27.66% of cases, making them the second most frequently used class. Combination antibiotic therapy was administered to 17.02% of patients, generally in cases with more pronounced clinical features or inadequate initial response. Other antibiotics accounted for 8.51% of prescriptions.

Clinical response to antibiotic therapy [Table 4]

The treatment outcomes following antibiotic therapy are presented in [Table 4]. A complete clinical response, characterized by resolution of signs and symptoms, was achieved in 70.21% of patients. Partial response, defined as noticeable improvement with persistence of mild symptoms, was observed in 21.28% of cases. Only 8.51% of patients showed no response to the initial antibiotic therapy, indicating a high overall effectiveness of the prescribed treatment regimens.

Association between gender and treatment response [Table 5]

[Table 5] evaluates the association between gender and treatment response. Among male patients, 73.08% achieved a complete response, while 26.92% had partial or no response. In female patients, complete response was observed in 66.67%, with 33.33% showing partial or no response. Statistical analysis using the Chi-square test revealed no significant association between gender and treatment outcome ($p = 0.512$).

Table 1: Demographic Characteristics of Study Participants (n = 94)

Variable	Frequency (n)	Percentage (%)
Gender		
Male	52	55.32
Female	42	44.68
Age Group (years)		
≤20	18	19.15
21–40	36	38.30
41–60	28	29.79
>60	12	12.76

Table 2: Clinical Presentation at Baseline

Clinical Feature	Number of Patients (n)	Percentage (%)
Conjunctival hyperemia	94	100.00
Purulent/mucopurulent discharge	88	93.62
Foreign body sensation	76	80.85
Eyelid sticking	70	74.47
Eyelid edema	48	51.06
Ocular irritation/discomfort	82	87.23

Table 3: Antibiotic Therapy Prescribed

Antibiotic Prescribed	Number of Patients (n)	Percentage (%)
Fluoroquinolones	44	46.81
Aminoglycosides	26	27.66
Combination therapy	16	17.02
Others	8	8.51

Table 4: Clinical Response to Antibiotic Therapy

Treatment Outcome	Number of Patients (n)	Percentage (%)
Complete response	66	70.21
Partial response	20	21.28
No response	8	8.51

Table 5: Association Between Gender and Treatment Response

Gender	Complete Response n (%)	Partial/No Response n (%)	p-value
Male (n = 52)	38 (73.08)	14 (26.92)	
Female (n = 42)	28 (66.67)	14 (33.33)	0.512

DISCUSSION

In the present study (n = 94), a mild male predominance was observed (55.32% males vs 44.68% females), and the most affected age group was 21–40 years (38.30%), followed by 41–60 years (29.79%). A similar gender trend has been reported in community-based conjunctivitis research, where males constituted 59.40% and females 40.60%; that study also reported bacterial conjunctivitis as a major proportion of conjunctivitis cases (68.10%), supporting the likelihood that bacterial disease is common in routine patient populations comparable to ours.[8]

Regarding diagnostic certainty, our study relied on clinical diagnosis (with conjunctival hyperemia in 100.00% and mucopurulent discharge in 93.62%), which reflects real-world decision-making in tertiary care. Rietveld et al (2004) demonstrated that among adults presenting with red eye and (muco) purulent discharge or glued eyelids, the overall prevalence of bacterial involvement was 32%, but could vary widely (reduced to 4% or increased to 77%) depending on key symptom patterns. This highlights why our high prevalence of "bacterial-leaning" features (notably discharge and eyelid sticking) may reasonably explain the high observed treatment response in our cohort, while also reminding

clinicians that clinical appearance alone can sometimes overestimate bacterial etiology.[9]

The baseline symptom profile in our patients—mucopurulent discharge (93.62%) and eyelid sticking (74.47%), along with foreign body sensation (80.85%) and irritation/discomfort (87.23%)—is consistent with features repeatedly linked with bacterial infection. Patel et al (2007) reported that 78% of children with conjunctivitis had positive bacterial cultures, and that the combination of sticky eyelids plus mucoid/purulent discharge yielded a very high post-test probability for bacterial infection (96%). Although that study was pediatric, it supports the clinical logic used in our cohort: high rates of discharge and eyelid sticking are strongly aligned with bacterial disease patterns and justify empirical antibiotic initiation when these features are prominent.[10]

In terms of antibiotic selection, fluoroquinolones were the most commonly prescribed agents in our setting (46.81%), followed by aminoglycosides (27.66%), with combination therapy used in 17.02%. In contrast, Supritha et al (2016) reported much higher fluoroquinolone use (94%), and among fluoroquinolones, moxifloxacin alone accounted for 52% of prescriptions. This difference suggests that our tertiary care prescribing may be relatively more diversified (greater aminoglycoside and combination use), potentially reflecting local formulary preferences, clinician concerns about resistance, cost considerations, or differences in severity mix at presentation.[11]

The overall treatment outcomes in our cohort were favorable: complete response occurred in 70.21%, partial response in 21.28%, and no response in 8.51% (improvement overall = 91.49% when complete and partial responses are combined). Rietveld et al (2005) reported similar real-world recovery proportions by day 7 in a randomized primary-care trial: 62% recovered with fusidic acid gel versus 59% with placebo, with baseline culture positivity of 32%. Compared with that, our complete response rate (70.21%) appears higher than the "recovered" proportion reported at one week in that trial, which may relate to differences in population, antibiotics used, follow-up definitions, or the inclusion of partial responders in clinical practice assessments.[12]

When comparing our outcomes with other controlled evidence, Rose et al (2005) observed that by day 7, clinical cure occurred in 86% of children receiving chloramphenicol and 83% receiving placebo. In our study, although complete response alone was 70.21%, adding partial responders raises overall improvement to 91.49%, which is broadly compatible with the high spontaneous resolution seen in many conjunctivitis cohorts—while still leaving a notable subgroup (8.51%) with no response, where reassessment, adherence review, organism considerations, or alternate diagnoses become important.[13]

The self-limiting nature of conjunctivitis also provides context for our response distribution. Sheikh et al (2001) reported that clinical remission occurred in 64% of placebo-treated patients by days 2–5, while antibiotics improved early remission (RR 1.31) with a possible benefit persisting for later remission (days 6–10; RR 1.27). In our cohort, the combined improvement rate (91.49%) aligns with the expectation that most patients improve with time and/or treatment, while our complete response rate (70.21%) supports that a substantial proportion achieve full resolution under standard antibiotic-based management typical of tertiary care.[14]

Finally, our analysis showed no significant association between gender and treatment response (male complete response 73.08% vs female 66.67%, $p = 0.512$), suggesting similar effectiveness of therapy across sexes in our setting. Williams et al (2013) similarly demonstrated that commonly used topical antibiotics can achieve very high cure in controlled settings: by day 7–10, clinical cure was 95% with moxifloxacin and 96% with polymyxin B–trimethoprim, and even earlier (day 4–6) parent-reported cure was 77% vs 72%. Compared with these trial outcomes, our real-world complete response (70.21%) is lower, but our overall improvement (91.49%) approaches trial-like effectiveness—likely reflecting differences in population mix, adherence, follow-up timing, and stricter "complete response" categorization in routine clinical documentation.[15]

CONCLUSION

This prospective study demonstrates that most patients with bacterial conjunctivitis show a favorable clinical response to topical antibiotic therapy when managed appropriately in a tertiary care setting. Broad-spectrum agents, particularly fluoroquinolones, were commonly prescribed and achieved high rates of complete or partial resolution of symptoms. The absence of a significant association between gender and treatment response suggests uniform effectiveness across patient groups. Prospective monitoring of clinical parameters is useful for identifying non-responders early and supports rational antibiotic use in routine ophthalmic practice.

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