Original Article

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Clinical Outcomes and Management Challenges of Pediatric Uveitis Associated with Systemic Rheumatic Diseases

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Abstract

Aim: Pediatric uveitis is a sight-threatening condition associated with various systemic diseases. The prognosis depends on both the etiology and multidisciplinary management. This study evaluates the etiology, clinical characteristics, and outcomes of pediatric uveitis managed through a coordinated rheumatology-ophthalmology approach.

Methods: This retrospective cross-sectional study included patients diagnosed before age 16 who were followed jointly for ≥6 months. Demographics, clinical presentations, underlying diseases, treatments, and outcomes were extracted from medical records. The primary endpoint of this study was to identify the systemic etiological spectrum of pediatric uveitis. The secondary endpoints were to evaluate clinical characteristics and the efficacy of various treatment modalities with respect to disease course and achievement of ocular remission (complete or partial) during follow-up.

Results: Of the 109 enrolled patients, 73 patients with systemic disease-related uveitis were analyzed; 51% were female. Juvenile idiopathic arthritis (JIA) was the leading cause (70% of cases), followed by probable sarcoidosis (17.6%) and Behçet's disease (BD) (11%). The mean age was 11.1±4.2 years. Juvenile idiopathic arthritis was more prevalent in younger children; BD was more prevalent in older age groups. Anterior uveitis (71.2%), chronic course (74%), and bilateral involvement (75.3%) predominated. Antinuclear antibodies positivity was 64.4%. Treatment included systemic steroids (71%) and methotrexate/biologics (65.7%). Both sarcoidosis and BD groups demonstrated favorable outcomes: clinical remission was achieved in 12 of 13 (92.3%) sarcoidosis patients and 8 of 8 (100%) BD patients. Relapse rates were lower in sarcoidosis (7.7%) and BD (12.5%) than in the JIA group (55%). Complications were observed in 38.5% of sarcoidosis patients and 12.5% of BD patients.

Conclusion: Pediatric uveitis requires aggressive immunosuppressive therapy. Juvenile idiopathic arthritis-associated uveitis is associated with a higher risk of relapse. Etiology influences outcomes.

Keywords: Autoimmune disease, biological therapy, prognosis, uveitis

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Introduction

Uveitis is an umbrella term for more than 30 distinct conditions characterized by intraocular inflammation. Although it primarily affects the densely vascularized and pigmented uveal tract of the eye, inflammation may spread to neighboring structures, including the vitreous, retina, and retinal vessels. Without appropriate and timely intervention, these conditions may progress collectively to cause irreversible vision loss (1).

Pediatric uveitis accounts for 2-14% of all uveitis cases, with an estimated incidence of 4.3 per 100,000 people and a prevalence of 27.9 per 100,000 people (2). The etiological diagnosis of childhood uveitis varies according to geographical, ethnic, and genetic factors, as well as referral patterns in the study population. The condition may manifest independently, as in idiopathic uveitis, or in connection with infectious and non-infectious (immune-mediated) causes. Non-infectious pediatric uveitis is an inflammatory condition that can lead to visual impairment (3). It occurs idiopathically in approximately half of cases or in association with systemic diseases such as juvenile idiopathic arthritis (JIA), Behçet's disease (BD), sarcoidosis, vasculitis, and tubulointerstitial nephritis and uveitis (TINU) syndrome (2,4,5). Given the complexity of intraocular inflammation, accurate diagnosis and effective treatment of rheumatic diseases require close collaboration between ophthalmologists and pediatric rheumatologists. While the existing literature provides insights into childhood uveitis, there is a lack of comprehensive data on the long-term outcomes of patients managed through such dedicated multidisciplinary partnerships.

We hypothesized that a coordinated, multidisciplinary approach in a tertiary-referral setting would enable more precise identification of the cause of disease and optimize clinical outcomes for complex, non-infectious pediatric uveitis cases. To address this gap, the present study evaluates our twelve-year institutional experience, focusing on patient demographics, disease subtypes, therapeutic strategies, and long-term prognosis.

Materials and Methods

Compliance with Ethical Standards

The study was approved by the Istanbul University Istanbul Faculty of Medicine Clinical Research Ethics Committee (no.: 1774366, date: 23.05.2023). The study was conducted in accordance with the principles of the Declaration of Helsinki, local regulations and written informed consent were obtained from the responsible adult for each patient.

Study Design and Patient Enrollment

This retrospective cross-sectional cohort study enrolled patients diagnosed with uveitis who had been under the care of tertiary pediatric rheumatology and ophthalmology clinics for at least six months, with enrollment between November 2011 and March 2023. Inclusion criteria included a confirmed diagnosis of uveitis before the age of 16, regular follow-up visits for at least six months, and the availability of complete medical records. Cases of uveitis associated with primary ophthalmological conditions clearly attributed to infectious etiologies (e.g., herpes virus, syphilis, or toxoplasmosis), as well as idiopathic uveitis without underlying or suspected rheumatological conditions, were excluded from the study. Data on patients, including demographic characteristics, clinical presentations, underlying diseases, laboratory results, uveitis manifestations, therapeutic interventions, and outcomes, were extracted from medical charts. The primary endpoint of this study was to identify the systemic etiological spectrum of pediatric uveitis. The secondary endpoints were to evaluate clinical characteristics and the efficacy of various treatment modalities with respect to disease course and achievement of ocular remission (complete or partial) during follow-up.

Uveitis Classification

Ophthalmologists classified uveitis in accordance with the guidelines established by the International Uveitis Working Group. Patients are categorized based on the anatomical location of the inflammation: anterior uveitis—inflammation primarily affecting the anterior chamber (including iritis, iridocyclitis, and anterior cyclitis); intermediate uveitis—inflammation primarily involving the vitreous (including pars planitis, posterior cyclitis, and hyalitis); posterior uveitis: inflammation primarily involving the retina/choroid (including choroiditis, chorioretinitis, retinitis, and neuroretinitis) and panuveitis: inflammation affecting all ocular regions. Regarding the clinical course, cases were classified as acute (characterized by an abrupt onset and limited duration), recurrent (characterized by repetitive episodes separated by inactive periods of at least three months without therapy), or chronic (characterized by reactivation occurring within three months of treatment cessation) (6).

Uveitis Outcomes

Uveitis outcomes, as assessed by ophthalmologists, were defined as follows: complete remission (with or without treatment): inactive ocular inflammation (no anterior chamber cells, no papilledema, no macular edema, no vitreous opacity, no floaters, or other complications) for at least six months following completion of therapy or anti-inflammatory treatments; partial remission—defined as the presence of anterior chamber cells up to 1+ grade, provided there were no new inflammatory complications; non-remission is defined as being refractory to treatment (6,7).

Diagnosis of Systemic Diseases

Patients who underwent a comprehensive diagnostic evaluation but for whom neither a definitive cause could be identified nor a specific diagnosis could be established were categorized as having "idiopathic uveitis" (8). The following standardized criteria were applied to the diagnosis of systemic diseases: JIA was diagnosed according to the International League of Associations for Rheumatology classification (9); BD was diagnosed according to the International Study Group criteria (10); sarcoidosis was diagnosed according to criteria established by the International Workshop on Ocular Sarcoidosis; probable sarcoidosis was diagnosed when a biopsy could not be performed (11). Tubulointerstitial nephritis and uveitis syndrome was diagnosed based on compatible clinical and laboratory findings in the absence of other identifiable causes (12).

Statistical Analysis

Descriptive statistics were used to summarize the demographic and clinical characteristics of the study cohort, including means and standard deviations for continuous variables and percentages for categorical variables. The distribution of anatomical locations, clinical course, and outcomes of uveitis was described using frequency counts and percentages.

For the analysis of follow-up duration and time to remission, median values with interquartile ranges (IQR) were reported, as the data were not normally distributed. All statistical analyses were performed using IBM SPSS for Windows, version 26.0 (New York, USA). Results were considered statistically significant at $p<0.05$.

Results

Patient Recruitment and Demographics

A total of 109 patients presenting to our department were initially enrolled in the study. Of these, 36 were excluded due to a diagnosis of idiopathic uveitis. The final analysis, therefore, included 73 patients with systemic disease-related uveitis (Figure 1). Female respondents constituted 51% of the total. The mean age of the cohort was 14.8±4.1 years, with a median follow-up period of 28 months (range 7-82 months). The mean age at uveitis diagnosis was 11.1±4.2 years. Underlying systemic conditions included JIA in 51 patients (70%), probable sarcoidosis in 13 patients (17.8%), BD in 8 patients (11%), and TINU in 1 patient (1.4%). Regarding the temporal sequence of diagnoses, 46 patients (63%) were diagnosed with a rheumatological condition before the onset of uveitis, 9 (12.3%) developed uveitis before receiving a rheumatological diagnosis, and 18 (24.6%) were diagnosed with both conditions simultaneously.

Anatomical classification revealed anterior uveitis in 52 patients (71.2%), intermediate uveitis in 3 patients (4.1%), posterior uveitis in 2 patients (3%), and panuveitis in 16 patients (22%). Regarding duration and disease course, the majority had chronic uveitis (54 patients, 74%) and a limited disease course (42 patients, 57.5%); 38 patients (52%) were symptomatic at presentation. Bilateral involvement was observed in 55 patients (75.3%) (Table 1).

At the initial uveitis visit, antinuclear antibody (ANA) positivity was detected in 64.4% of patients (38 out of 59 tested), primarily in the JIA-associated uveitis (JIAU) group (73.9%) (Table 1).

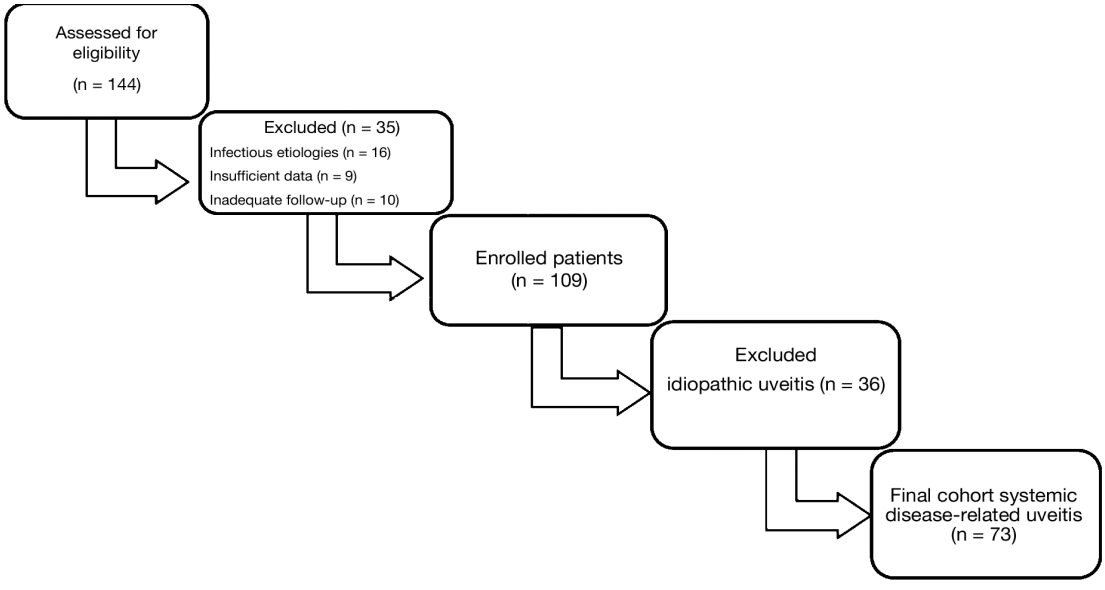

Figure 1. Flowchart for the selection of the study population

Table 1. Demographic, clinical and laboratory features of the patients with uveitis

	JIA	Sarcoidosis	Behçet	TINU
Number of patients, n (%)	51 (70%)	13 (17.6%)	8 (11%)	1 (1.4%)
Gender (Female), n (%)	30/51 (58.8%)	5/13 (38.5%)	2/8 (25%)	0/1 (0%)
Median age (years), (IQR 25-75)	5 (IQR: 4-8)	8.5 (6.7-11)	14.5 (13.0-17.2)	11
Initial diagnosis, n (%) Initially diagnosed with RD Concurrently diagnosed with RD and uveitis Initially diagnosed with uveitis	 41 (50%) 6 (11.8%) 4 (7.8%)	 2 (15.4%) 9 (69%) 2 (15.4%)	 3 (37.5%) 2 (25%) 3 (37.5%)	1 (100%)
Localization of uveitis, n (%) Anterior uveitis Intermediate uveitis Posterior uveitis Panuveitis uveitis	 47 (92.2%) 2 (3.9%) 1 (2%) 1 (2%)	 3 (23%) 0 1 (7.7%) 9 (69%)	 2 (25%) 0 0 6 (75%)	1 (100%)
Duration of uveitis, n (%) Limited Persistent	 33 (65%) 18 (35%)	 4 (18.2%) 9 (69%)	 5 (62.5%) 3 (37.5%)	1 (100%)
Course of uveitis, n (%) Acute Recurrent Chronic	 5 (9.9%) 7 (13.7%) 39 (76.5%)	 2 (15.4%) 0 11 (84.6%)	 4 (50%) 1 (12.5%) 3 (37.5%)	1 (100%)
Bilateral involvement, n (%)	37 (72.5%)	10 (77%)	7 (87.5%)	1 (100%)
Symptomatic, n (%)	18 (35%)	12 (92.3%)	7 (87.5%)	1 (100%)
ANA positivity, n/N (%)	34/46 (73.9%)	3/10 (33.3%)	1/3 (33.3%)	0
CRP positivity, n (%)	30 (58.8%)	9 (69%)	1 (12.5%)	0
ESR positivity, n (%)	26 (51%)	5 (38.5%)	1 (12.5%)	0

JIA: Juvenile idiopathic arthritis, TINU: Tubulointerstitial nephritis and uveitis, RD: Rheumatologic disease, ANA: Antinuclear antibody, CRP: C-reactive protein, ESR: Erythrocyte sedimentation rate, IQR: Interquartile range

All patients received topical glucocorticosteroids and cycloplegic drops. Systemic steroids were administered to 52 patients (71%), beginning at 1-2 mg/kg/day, with doses tapered after two weeks. The most commonly used immunosuppressive treatments were methotrexate (MTX) and biologic disease-modifying antirheumatic drugs (bDMARDs) (65.7% each).

Complete remission was achieved in 32 patients (44%), partial remission in 26 patients (36%), and remission was not achieved in 15 patients (21%) (Table 2). Regarding disease progression, nine patients (12.3%) required surgical intervention. Complications were observed in 23 patients (31.5%), and relapses in 30 patients (41%) (Table 2).

Data of Patients with JIAU

Among the 51 patients with JIA, the subtype distribution was as follows: thirty (58.8%) were classified as persistent, six (11.8%) as extended oligoarticular, eight (15.7%) as rheumatoid factor-negative polyarticular, four (7.8%) as enthesitis-related, two (3.9%) as psoriatic, and one (2.0%) as systemic.

The median age at uveitis diagnosis was 5 years (IQR 4-8 years), with a median follow-up of 30 months (IQR 13.9-75.7 months). When JIA preceded uveitis, the median interval from JIA diagnosis to uveitis onset was 28 months (IQR 13-48 months). When uveitis preceded JIA, the median interval from uveitis diagnosis to JIA onset was 37 months (IQR 8-78 months) (Table 1).

All patients received topical therapy, and 35 patients (68.6%) received systemic steroids. At the onset of uveitis, among the 51 JIA patients, 16 (31.4%) were not receiving treatment, 19 (37.3%) were receiving MTX monotherapy, 6 (11.7%) were receiving disease-modifying antirheumatic drugs (DMARDs) alone, and 10 (19.6%) were receiving combination therapy. Following diagnosis, treatment was intensified: 36 patients (70.6%) ultimately received conventional DMARDs (35 received MTX and one received sulfasalazine), and 32 patients (62.7%) received bDMARDs. Specifically, 14 of 16 patients not receiving treatment initiated MTX therapy, and 14 of 19 patients already receiving MTX added adalimumab. Importantly, all 11 patients who were receiving etanercept (as monotherapy or in combination with other drugs) at the time of diagnosis were promptly switched to adalimumab (n=9) or tocilizumab (n=2). By the final follow-up, the bDMARDs administered included adalimumab (n=27), tocilizumab (n=2), etanercept (n=2 for arthritis alone), and infliximab (n=1); 25 patients (49%) were managed with combination therapy (Table 2).

Table 2. Treatment characteristics and clinical outcomes of uveitis

	JIA	Sarcoidosis	Behçet	TINU
Local treatment	51 (100%)	13 (100%)	8 (100%)	1 (100%)
Systemic steroid, n (%)	35 (68.6%)	12 (92%)	4 (50%)	1 (100%)
MTX, n (%)	35 (68.6%)	13 (100%)	0	0
SZP, n (%)	1 (2%)	0	0	0
bDMARD, n (%)	32 (63%)	13 (100%)	2 (25%)	1 (100%)
MMF, n (%)	0	2 (15.4%)	0	0
AZT, n (%)	0	0	7 (87.5%)	0
Surgery intervention	5 (9.8%)	3 (23%)	1 (12.5%)	0
Complication	16 (31.6%)	5 (38.4%)	1 (12.5%)	1 (100%)
Recurrence	28 (55%)	1 (8%)	1 (12.5%)	0
Outcome Complete remission Partial remission Non-remission	 20 (39.2%) 19 (37.2%) 12 (23.5%)	 7 (54%) 4 (31%) 2 (15%)	 5 (62.5%) 3 (37.5%) 0	1 (100%)

JIA: Juvenile idiopathic arthritis, TINU: Tubulointerstitial nephritis and uveitis, MTX: Methotrexate, SZP: Sulfasalazine, bDMARDs: Biological disease-modifying antirheumatic drugs, MMF: Mycophenolate mofetil, AZT: Azathioprine

Surgical intervention was required for only five patients (9.8%). Complications were observed in 16 patients (31.6%), including cataracts (n=6), band keratopathy (n=2), glaucoma (n=2), posterior synechiae (n=3), and visual impairment (n=3). Relapse occurred in 28 patients (55%). No cases of legal blindness were recorded during the follow-up period.

At the final follow-up visit, 20 patients (39.2%) had achieved complete remission (Table 2).

Data of Patients with Sarcoidosis-related Uveitis

The median age of the 13 patients with probable sarcoidosis-related uveitis was 8.5 years (IQR 6.7-11 years); the median follow-up period was 34.8 months (23.9-48.1 months). Uveitis was diagnosed concurrently with sarcoidosis in 69% of patients. Panuveitis was present in 69% of patients and was chronic in 84.6% of cases had a chronic active course. The ocular condition affected both eyes in 77% of cases; 92.3% of patients presented with clinical manifestations, including conjunctival hyperemia, decreased vision, eye pain, and blurred vision.

All patients received topical therapy, and 12 (92%) were treated with systemic steroids. Combination therapy with MTX and adalimumab was initiated in 10 patients (77%), of whom two had discontinued MTX and added mycophenolate mofetil to adalimumab after a uveitis relapse; one had stopped MTX due to gastrointestinal side effects and continued adalimumab monotherapy; and one had replaced adalimumab with infliximab due to worsening arthritic symptoms. One patient was initially treated with MTX and infliximab. Two patients (15.4%) who received MTX monotherapy were subsequently treated with adalimumab monotherapy.

Surgical intervention was necessary for three patients. Complications arose in five patients (two with cataracts, two with band keratopathy, and one with glaucoma). Only one patient experienced a recurrence of the disease, while two patients did not respond to treatment at the last follow-up.

Data of Patients with Behçet's Uveitis

The median age of the eight patients with Behçet-related uveitis was 14.5 years (IQR 13.0-17.2 years), with a median follow-up period of 26 months (range 4.5-82 months). Three patients (37.5%) were diagnosed with BD prior to uveitis, while two patients (25%) received both diagnoses simultaneously. The remaining three patients (37.5%) were diagnosed with uveitis before BD was identified. The majority (75%) of patients presented with panuveitis, and four patients (50%) presented with acute uveitis. Ocular involvement was bilateral in 87.5% of patients and was symptomatic; a limited clinical course was observed in 62.5% of cases.

A review of the treatment protocols revealed that all patients received topical therapy. Systemic corticosteroids were administered to four patients (50%). Two patients (25%) were treated with colchicine, and five patients (62.5%) were treated with a combination of azathioprine (AZT) and colchicine. Due to disease progression, the treatment for one of these patients was changed to infliximab and cyclosporine. In another case, initial therapy with cyclosporine and AZT for six months was switched to infliximab because of persistent uveitis. After the patient had achieved two years of remission, infliximab was discontinued and AZT was reintroduced.

Surgical intervention was required for one patient. One patient developed retinitis as a complication, and another patient experienced a disease relapse. At the final follow-up, five patients were in complete remission and three were in partial remission.

Data of Patients with TINU Syndrome

An 11-year-old male patient with TINU syndrome was followed for 7 months. The initial presentation included bilateral ocular hyperaemia and intermediate, chronic, and persistent uveitis. Treatment initially comprised topical and systemic steroid therapy, but adalimumab was introduced after three months. The patient achieved partial remission at the final follow-up.

Discussion

This retrospective cohort study provides comprehensive data on patients with chronic uveitis of pediatric onset that is non-infectious and associated with systemic disease. The study offers insight into the condition's clinical features, treatment approaches, and outcomes. Uveitis was predominantly anterior and bilateral and was most frequently associated with ANA-positive oligoarticular JIA. Despite the difficulties of treating pediatric uveitis, more than half of our patients went into complete remission, and none of them went blind. This shows how well MTX and biologic therapy work for this group of patients.

In our cohort, JIAU was the leading etiology, followed by sarcoidosis. While idiopathic uveitis is commonly reported as the most frequent cause worldwide (3,13), JIA remains the most important systemic association in Europe and North America. Our JIA rate was higher than in most international series (16-25%) (14-18). We attribute this difference to our study design, which included only patients with suspected rheumatological conditions and excluded those with idiopathic uveitis. By contrast, the BUST Registry reported JIA in only 12.4% of pediatric uveitis cases (19); studies from Japan reported almost no JIA cases, with BD predominating (20).

In line with data from endemic regions along the Silk Road, BD was the third most frequent systemic cause. In Türkiye, pediatric studies have reported the prevalence of Behçet's uveitis ranging from 9.3% to 19.7%, thereby ranking it among the two most common systemic associations (21-24). Studies from Israel, where BD is also endemic, have documented Behçet's uveitis in 4.6-26.3% of pediatric patients (25-27). The etiological distribution of uveitis due to BD varies considerably with geographic, genetic, and demographic factors, as well as institutional referral patterns. Additionally, the use of different definitions of the pediatric age range can lead to discrepancies in etiology, resulting in notable variations even among studies from the same geographical region (19). Therefore, our data highlight that in endemic regions, BD remains a critical differential diagnosis in pediatric uveitis, even when JIA is the primary systemic association.

In our study, the mean age at uveitis diagnosis was 11.1±4.2 years. Juvenile idiopathic arthritis tended to present in younger children, whereas BD was more prevalent in older age groups. Similarly, when analyzed by age group, Altınel et al. (28) found that JIAU was most frequently observed in the preschool-age group, while BD was most frequently observed in the late-school-age group. The BUST Study Group's National Registry Report also found that JIA was the most common systemic disease in kids under 10 years old, while BD was the most common systemic disease in kids 10 years old and older (19). This pattern likely reflects the distinct pathophysiological mechanisms and immune system maturation processes underlying these conditions. This age-stratified distribution has important clinical implications, as it can help clinicians develop age-appropriate diagnostic algorithms and screening protocols.

The majority of uveitis cases in our cohort presented with an anterior localization, a chronic course, and bilateral involvement. These findings are consistent with those reported in the existing literature (3,13,15,17,28,29). However, the anatomical distribution varied significantly according to the underlying cause: anterior uveitis predominated in most JIA patients, whereas panuveitis predominated in approximately three-quarters of patients with sarcoidosis or BD. The predominance of anterior uveitis in our cohort largely reflects the high proportion of JIA patients, who typically present with chronic bilateral anterior uveitis. Our findings are consistent with previous reports demonstrating that anterior uveitis is the most common type among pediatric patients, affecting approximately 80% of cases (16,17,30). Similarly, the pattern of panuveitis observed in most of our BD patients confirms existing knowledge and mirrors the findings of Koru et al. (17), who reported panuveitis in all BD patients.

In line with previous reports, the majority of cases showed chronic bilateral involvement, highlighting the severe nature of the disease (3,8,16,17,30,31). Although the majority of JIA patients were asymptomatic, only 35% exhibited symptoms, highlighting the asymptomatic nature of JIAU. Another study found that approximately 40% of patients with BD reported no symptoms (17). This may be due to children's limited ability to recognize or report ocular problems, compared with adults who have the same disease. Therefore, we believe that uveitis screening is crucial to identify these asymptomatic cases, even in the absence of ocular complaints.

Consistent with the existing literature, our study confirmed that the oligoarticular subtype and ANA positivity are key risk factors for the development of uveitis

in JIA patients (32). Of our JIA patients with uveitis, 64.4% were ANA positive and 70.6% had oligoarticular disease. This is consistent with previous studies demonstrating that these features are risk factors for JIAU (2-4,32-34).

Our treatment approach produced inconsistent results among various uveitis etiologies, highlighting the challenges of managing the condition in pediatric patients. The overall treatment strategy involved a step-up approach: topical corticosteroids and cycloplegic agents were administered to all patients initially, followed by systemic interventions based on disease severity and response. The high utilization of systemic corticosteroids aligns with current guidelines, which recommend early, aggressive treatment to prevent complications (35,36). The successful tapering protocol after two weeks helped minimize steroid-related side effects while maintaining therapeutic efficacy. Methotrexate was the most frequently used immunosuppressive agent, consistent with its established role as a first-line, steroid-sparing therapy for pediatric uveitis (35-37). Biologic therapy was required for 65.7% of our patients. According to current treatment guidelines (35-38), anti-tumor necrosis factor agents were the most commonly used biologic treatments. The significant proportion of patients requiring biologic DMARDs highlights the refractory nature of pediatric uveitis and the shift toward earlier biologic intervention.

Among patients with JIAU in our cohort, the primary treatment consisted of conventional DMARDs, predominantly MTX, which has been used at similar rates in previous studies (60-82%) (15,19,37). Adalimumab was the most frequently used biologic agent, reflecting findings from the SYCAMORE trial, which demonstrated the superiority of adalimumab in combination with MTX over MTX monotherapy (38). Similarly, another study reported MTX use in 87% of patients, with bDMARDs added in 73.9% of treatment-resistant cases. This regimen achieved a treatment response in 26.1% of patients at the final visit (15).

The management of sarcoidosis-associated uveitis proved particularly challenging, as all patients required systemic immunosuppression, often as combination therapy with MTX and adalimumab, due to the predominance of panuveitis. The frequent need to modify treatment reflected the severe course of the disease, as also reported in pediatric sarcoid uveitis studies (39-41). In our cohort, the most aggressive regimens were required for uveitis associated with both JIA and probable sarcoidosis, characterized by substantial systemic treatment requirements and early use of biologics. This highlights the chronic, severe inflammatory nature of these conditions and their resistance to conventional therapy.

Complications occurred in 31.5% of the cohort, relapses occurred in 41% of the cohort, and surgical intervention was required in only 12.3% of the cohort. Recent pediatric uveitis series have reported variable complication rates, ranging from 11.4% to 69% across studies (42-44). Yalçındağ et al. (21) reported complications in 26.1% of cases, with surgical intervention in 2.8%, while other studies showed complication rates ranging from 34% to 76.1% and surgical intervention rates of 8-46% (15,22). By comparison, our lower complication rate and surgical intervention rate may reflect earlier use of biologics, rigorous screening protocols, and effective multidisciplinary collaboration between the rheumatology and ophthalmology departments. We achieved favorable outcomes that support the validity of our therapeutic approach with 44% complete remission and 36% partial remission at the final follow-up. A notable finding was that, despite JIA patients demonstrating the complication and recurrence rates, only 23.5% remained non-remissive at the final visit and no cases of blindness were observed, which contrasts with previous studies (39,45).

It was similarly noteworthy that patients with sarcoidosis and BD, despite presenting with chronic panuveitis, achieved remission by the final follow-up appointment, with no progression to blindness. We attribute this outcome to our earlier escalation strategy, which aligns with current guidelines that advocate prompt treatment intensification.

Study Limitations

Our study has several limitations. Primarily, it is retrospective and single-center; follow-up durations are variable, which may affect the assessment of long-term outcomes. The relatively small sample sizes in certain subgroups, such as those with BD or TINU, mean that these findings should be interpreted with caution. Retrospective constraints also limited the uniformity of diagnostic procedures and the availability of advanced genetic testing and ocular imaging. Furthermore, diagnosing systemic diseases in children is challenging, as symptoms may emerge long after the onset of uveitis. Despite these limitations, a key strength of our study is the longitudinal evaluation of a broad spectrum of causes managed within a dedicated multidisciplinary model.

Conclusion

Our data suggest that the early use of biologics, particularly in ANA-positive JIA and sarcoidosis-associated uveitis, when combined with close collaboration between rheumatologists and ophthalmologists, reduces complications and improves visual outcomes. This multidisciplinary approach allows for timely screening, early diagnosis, and intensified treatment before irreversible damage occurs.

Ethics

Ethics Committee Approval: The study was approved by the Istanbul University Istanbul Faculty of Medicine Clinical Research Ethics Committee (no.: 1774366, date: 23.05.2023).

Informed Consent: Written informed consent were obtained from the responsible adult for each patient.

Footnotes

Authorship Contributions

Concept: V.G., F.G.D., M.C., T.O., M.E., N.A.A., Design: V.G., F.G.D., M.C., T.O., M.E., N.A.A., Data Collection or Processing: V.G., F.G.D., O.C., M.C., T.O., M.E., N.A.A., Analysis or Interpretation: V.G., F.G.D., T.O., M.E., N.A.A., Literature Search: V.G., F.G.D., M.C., T.O., M.E., N.A.A., Writing: V.G., F.G.D., M.C., M.E., N.A.A.

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